Chapter 4

USFWS

Black duck

Environmental Consequences

4.1 Introduction

This chapter describes the foreseeable environmental consequences we predict from implementing the refuge management alternatives presented in chapter 3. Specifically, we predict the beneficial and adverse effects of implementing the management actions and strategies for both alternatives:

- Alternative A: Current Management (No Action Alternative), which serves as a baseline for comparing the other alternative
- Alternative B: Focus on Species of Conservation Concern (Service-preferred Alternative)

In this chapter we describe the direct, indirect, short-term, and cumulative effects likely to occur over the 15-year life span of this CCP. Beyond the 15-year planning horizon, we give a more approximate description of environmental consequences. Where detailed information is available, we present a scientific and analytic comparison of the alternatives and their anticipated impacts and effects on the environment. When detailed information is not available, we base those comparisons on our professional judgment and experience. At the end of this chapter, table 4.3 summarizes the effects predicted for each alternative and provides a side-by-side comparison. Our discussion also relates the predicted impacts of the alternatives to the refuge goals and the key issues identified in chapter 1.

Regulations adopted by the Council for Environmental Quality and the Service on implementing NEPA require that we assess the significance of the effects of all alternatives based on their context, duration, and intensity.

The context of our impact analysis ranges from site specific to regional and landscape-scale, depending on how widely the effect of an action can be observed. Certain actions (such as removal of invasive plant species) may have effects only in a very local context, while others (such as participation in regional partnerships) may have effects in a much broader context (see table 4.1). However, it is important to note that even local actions may have cumulative effects in a larger context, when combined with other actions. For example, invasive plant control on a local scale, when combined with other control efforts across that landscape, could result in combined, significant effect by reducing the overall abundance and distribution of invasive species. Although the refuge is only a small percentage of the larger ecoregion, we developed the two management alternatives to contribute toward regional conservation goals. Our proposed conservation objectives and strategies for species and habitats are consistent with regional, State, and Service landscape-level plans identified in chapter 1, including the Virginia Wildlife Action Plan and the BCR 30 Plan.

Table 4.1 provides context for the analysis, including the size of the refuge in area, major habitat types and their acreages, lengths of existing and proposed trails, amount of administrative roads, and amount of area that is predicted to be disturbed during any new construction.

Table 4.1. Existing Context for Impacts Analysis at Presquile NWR

Unit	Relevant Dimensions
Chesapeake Bay Watershed	64,000 square miles
New England/Mid-Atlantic Coast-Bird Conservation Region	38,152 square miles
James River Watershed	10,156 square miles
Charles City, Chesterfield, and Henrico counties (combined)	567,040 acres
City of Hopewell in Prince George County	6,912 acres

Unit	Relevant Dimensions
Length of shoreline along Presquile	6 miles
Presquile NWR	1,329 acres
Tidal swamp habitat	738 acres
Grassland/old field habitat	200 acres
Tidal freshwater marsh habitat	189 acres
James River and associated backwaters	101 acres
Mature mixed mesic forest habitat	46 acres
Transitional mixed mesic forest habitat	20 acres
River escarpment habitat	11 acres
Footprint of existing maintenance and refuge buildings	0.2 acres
Length of trail network	3.5 miles
Length of boardwalk	550 feet

Some impacts are not considered major or significant, and are described as either negligible, minor, or moderate. The magnitude of such changes is defined as follows:

- Negligible—Management actions would result in impacts that would not be detectable or if detected, would have effects that would be considered slight, localized, and short-term.

- Minor—Management actions would result in a detectable change, but the change would be slight and have only a local effect on the community, the resource, or ecological processes. The change would be discountable, insignificant, and of little consequence and short-term in nature.

- Moderate—Management actions would result in a clearly detectable change. This could include changes to a local biotic population or habitat sufficient to cause [a] change in [the] abundance, distribution, or composition, but not changes that would affect the viability of regional populations or habitats. Changes to local ecological processes would be of a limited extent.

- Major—Management actions would result in a clearly detectable change. The impacts would be substantial and highly noticeable and could result in widespread change. This could include changes in the abundance, distribution, or composition of a local or regional populations or habitats to the extent that it would not likely recover or continue in its previous condition or size. Significant ecological processes would be altered, and changes throughout the ecosystem would be expected.

In addition to the magnitude of impact (negligible, minor, moderate, or major) the impacts of the management action on some of the environmental attributes are also described as beneficial or adverse. Generally, an impact will be described as 'beneficial' if it results in a condition that improves the biological health, population size of native or naturally occurring species, or the robustness or sustainability of that characteristic.

However, many times value judgments cannot be given for ecological change. A change in habitat that is beneficial for certain species of migratory bird may be adverse for others with different habitat preferences. Factors which reduce the population of a predator may be adverse for the predator and positive for the prey. Therefore, sometimes our impact assessments do not describe impacts as either positive or negative, or describe them specifically in term of what the impact applies to. The duration of identified effects and their consequences varies, from those occurring only once for a brief period in the 15-year period of this plan—for example, the effects of construction for expanding existing facilities—to those occurring more frequently during the year, like mowing or invasive species control. The environmental consequences analysis provided in this chapter will also furnish the level of detail necessary to assess the compatibility of all proposed uses. The duration of identified effects and their consequences varies, from short-term or those that last for a matter of days or weeks, such as noise produced by construction, to permanent such as structure removal.

We based our evaluation of the frequency and intensity of the effects from implementing the alternatives on these factors:

- The expected degree or percent of change in the resource from current conditions;
- The frequency and duration of the effect;
- The sensitivity of the resource to such an effect, or its natural resiliency to recover from such an effect;
- The potential for implementing effective preventive or mitigating measures to lessen the effect.

Finally, we consider the:

- Cumulative effects;
- Relationship between short-term uses of the human environment and the enhancement of long-term productivity;
- The potential irreversible and irretrievable commitments of resources;
- Energy efficiency; and
- Environmental justice impacts.

The Environmental Baseline: For this analysis we assume that the baseline is the condition of the refuge as of mid-2012. Thus, alternative A assumes little change in current habitat condition, with continued manipulations to maintain early successional habitat on 200 acres, plant native trees along the shoreline and treat invasive plants. There would be no change to the existing public access and trail infrastructure. Alternative B assumes that the Service will undertake future activities to restore the refuge to a more natural forest ecosystem than exists today, with the goal to promote conditions that are more sustainable into the future under conditions that require minimal intervention.

We do not provide a detailed individual analysis of the environmental impacts of certain proposed projects in this chapter. These include aspects of management that are common to both alternatives and do not individually or cumulatively have

a significant effect on the quality of the human environment. The following would qualify for exclusion under the Service's list of categorical exclusions (as listed in 516 DM 8.5A), if individually proposed:

- Environmental education and interpretive programs (unless major construction is involved or significant increase in visitation is expected)
- Non-destructive research, resource inventories, monitoring, and other resource information collection
- Operations and maintenance of existing infrastructure and facilities (unless major renovation is involved)
- Certain minor, routine, recurring management activities and improvements;
- Small construction projects (e.g., fences, kiosks, and interpretive signs)
- Native vegetation planting and invasive plant control
- Minor changes in amounts and types of public use
- Issuance of new or revised management plans when only minor changes are planned
- Law enforcement activities

We recognize that we cannot fully address all the potential consequences involved with the alternatives through this planning process. We describe in chapter 3 section 3.4.11, under the heading "Additional NEPA Analysis," those future management decisions that may require more detailed analysis before a choice is made. They are also major actions that would not be excepted from the list above. We attempt to analyze the impacts of some of the available choices in this document to the extent possible, but a more detailed analysis will be required to inform the final choice. For specific projects evaluated in the future, NEPA documents would be prepared that address and fully analyze the potential consequences including adverse impacts and benefits. Our goal is to develop and implement all future plans to minimize the impact to each resource while maximizing the long-term benefit to each resource. Each additional NEPA analysis will include compliance with Federal laws and mandates including the Endangered Species Act, the National Historic Preservation Act, and the Coastal Zone Management Act.

Although not a comprehensive list, we recognize that further analysis would be required for these projects and outcomes:

- Shoreline erosion: To protect vulnerable natural and cultural resources associated with the refuge's shoreline at Turkey Island cutoff channel.
- Transportation to and from the refuge: To offer safe transportation facilities that are used to transfer heavy equipment and refuge visitors to the refuge.

4.2 Chapter Organization

Our analysis first focuses on broad, regional-scale impacts, then examines more refuge-specific impacts. The chapter is organized as follows:

Regional-scale impacts
- Air quality
- Hydrology and water quality
- Socioeconomic environment

Refuge-specific impacts
- Soils
- Freshwater wetland habitats and vegetation
- Upland habitats and vegetation
- Species of special concern
- Birds
- Fisheries
- Mammals
- Amphibians and reptiles
- Invertebrates
- Archaeological, historical, and cultural resources
- Public use and access

Under each heading we discuss the resource context, benefits, and adverse impacts of management actions that would occur regardless of which alternative is selected, followed by the benefits and adverse impacts of each of the alternatives. We examine the impacts of current and proposed administrative or general operations, habitat management, and visitor services/public uses on each of the physical, biological, and cultural resources noted above.

A matrix table at the end of this chapter (table 4.3) is a summary of the impacts associated different approaches to delivering refuge wildlife and habitat conservation actions and providing public access and recreational uses. It compares the impacts associated with current management (alternative A) and the Service-preferred alternative (alternative B). Both alternatives seek to conserve wildlife and their associated habitats and provide quality recreational and educational opportunities for visitors.

We end the chapter with discussions on:

- Cumulative impacts;
- The relationship between short-term uses of the human environment and enhancement of long-term productivity;
- Unavoidable adverse effects;
- Potential irreversible and irretrievable commitments of resources;
- Energy efficiency; and
- Environmental justice.

Regional-scale Impacts

4.3 Air Quality

The potential adverse air quality effects of the alternatives that we evaluated included increases in pollutants from:

- Using prescribed fires to manage grasslands;
- Applying herbicides to control invasive plants;
- Blowing dust from construction sites, roads, and trails; and
- Increasing emissions from vehicles and equipment.

4.3.1 Air Quality Impacts That Would Not Vary by Alternative

Regardless of which management alternative our regional director selects, refuge management activities should not adversely affect regional air quality. None of the alternatives would violate EPA standards; both alternatives would be in implemented in compliance with the Clean Air Act.

As needed, we would consult with the following offices to be protective of air quality in the refuge vicinity:

- VDEQ's Division of Air Program Coordination for guidance regarding refuge activities that have the potential to adversely impact air quality in the vicinity.
- VDEQ's Piedmont Regional Office to acquire permits for boilers or fuel-burning equipment.

As needed, we would consider the following recommendations from the VDEQ regarding construction project design and implementation:

- Design, construct, and maintain refuge facilities in a manner that avoids or minimizes traffic congestion or unnecessary localized idling.
- Employ precautionary measures during construction to restrict emissions of volatile organic compounds and oxides of nitrogen, especially during periods of high ozone.
- Employ measures, such as application of water to suppress dust and wash down construction vehicles and paved roadways immediately adjacent to the construction site, to minimize fugitive dust in accordance with Virginia's Administrative Codes (9 VAC 5-40-5630 et seq. and 9 VAC 5-40-5600 et seq.), as applicable.

No major stationary or mobile sources of air pollutants are present at the refuge and refuge management would create none. On the contrary, the Service limits the uses of the refuge to compatible, wildlife-oriented, consumptive and non-consumptive uses, and thus, curtails anthropogenic sources of emissions by maintaining wetlands, grasslands, and forests in natural vegetation cover. Therefore, in analyzing the impacts on air quality, we considered only how Service actions at the refuge might affect criteria air pollutants, visibility, and global warming to a minimal degree, and focused instead on the potential for localized air quality impacts or improvement.

Beneficial Impacts
Regional air quality should not be adversely affected by refuge management activities regardless of which alternative is selected. There are no major stationary or mobile sources of air pollution present on Service-owned lands, nor would any be created under any of the alternatives.

Adverse Impacts
Under either alternative, synthetic sources of emissions from refuge activities and visitor vehicles are negligible compared to emissions associated with the variety of industrial, commercial, and transportation uses around the Chester and Hopewell area. However, we recognize that even low levels of emissions from fuel-burning engines of boats and vehicles on the refuge can contribute to air quality of the refuge vicinity.

4.3.2 Air Quality Impacts of Alternative A

Beneficial Impacts
Refuge land management would help sustain the current air quality by maintaining natural vegetative cover on up to 1,329 acres at Presquile NWR and by allowing limited public uses to those that are appropriate, compatible, and wildlife-oriented activities. Collectively, these management actions would

help reduce the potential for additional synthetic sources of emissions in the surrounding landscape and provide long-term benefits for air filtering and carbon sequestration from land protection.

Alternative A would include fewer ground-disturbing management activities that would introduce additional short-term emission sources than alternative B.

Adverse Impacts
The regional vehicle emissions resulting from approximately 640 visitors to Service-owned lands would continue to be negligible in comparison to ambient air quality and emission from the surrounding region.

Some negligible short-term impacts may result from using prescribed fire to manage the 200 acres of grasslands. We infrequently use prescribed fire because favorable conditions for prescribed burning are rare and prescribed fire has not appreciably helped with invasive plant control. However, under alternative A, we retain the flexibility to use it as a management tool under the right conditions.

The major pollutants from prescribed burning are particulates and gases. Particulates, which consist of small particles of ash, partly consumed fuel, and liquid droplets can reduce visibility or cause negative effects on the health of people with respiratory illnesses. The gases released by prescribed burns include carbon monoxide, carbon dioxide, hydrocarbons, and small quantities of nitrogen oxides. However, low-intensity prescribed burning, which would be used on the refuge, releases inconsequential amounts of these gases (USDA 1989). We would follow prescribed burn plans, which consider smoke management and other environmental and geographical factors, to minimize impacts on surrounding areas. Based on our experience, we expect the level of prescribed burning we are proposing under alternative A to produce no major, long-term adverse air quality impacts, nor would these activities contribute to any substantial cumulative increase in ozone levels, particulate matter, or other negative air quality parameters whether regionally or on the refuge.

4.3.3 Air Quality Impacts of Alternative B

Beneficial Impacts
We anticipate that the long-term benefits for air filtering and carbon sequestration from refuge management would be greater than those in alternative A due to the increase in forest habitat. Conversion of 177 acres of grassland habitat to woody, shrubby vegetation in the transitional mixed mesic forest habitat, and eventually to a mature mixed mesic forest, would reduce the amount of mowing required to maintain the current grassland habitat and, thereby, reduce the emissions from refuge equipment. The major reduction in grasslands under this alternative dramatically reduces the need for prescribed burning as a management tool. Only small burns, such as debris piles from trail maintenance activities, would be expected to occur.

Adverse Impacts
Management activities involved in refuge habitat management and visitor service facility construction and maintenance would cause short-term, localized effects from construction vehicles and equipment exhausts would occur.

Expanding refuge programs and outreach efforts and improving facilities and exhibits is expected to increase annual visitation from approximately 640 visitors to more than 3,960 over the 15-year period of the plan. A marginal increase in local vehicle emissions would result from the increase in visitation, but it would be negligible in comparison to ambient air quality and emissions from industrial land uses surrounding the refuge.

These impacts are not expected to exceed Federal Clean Air Act air quality standards. No Class I air quality areas are affected.

4.4 Hydrology and Water Quality

Management actions proposed for the refuge's CCP alternatives were evaluated and compared based on their potential to help maintain and improve the hydrology and water quality of the wetlands, rivers, ponds, and vernal pools of the James River watershed and Chesapeake Bay Estuary. We evaluated the benefits of actions that would protect or restore the hydrology or maintain or improve water quality including:

- Shoreline protection and restoration
- Implementing best management practices to protect soils and vegetation
- Plant and maintain vegetation in riparian areas

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Ferrying trees out to the refuge to be planted.

We evaluated and compared the impacts of refuge management actions with the potential to cause adverse effects to hydrology and water quality including:

- Use of herbicides to manage invasive species
- Refuge construction projects
- Changes in recreational use that might lead to increased siltation into refuge waterways and petroleum product contamination

4.4.1 Hydrology and Water Quality Impacts That Would Not Vary by Alternative

Regardless of which alternative we select, we would take a number of steps to ensure that we have sufficient scientific data to support management decisions regarding refuge hydrology and water quality.

As needed, we would consult with the following offices to be protective of land and water quality in the refuge vicinity:

- VDCR Regional Office to ensure compliance with State law and regulations:
  - Virginia erosion and sediment control law and regulations
  - Virginia stormwater management law and regulations (including coverage under the general permit for stormwater discharge from construction activities)
  - Other applicable Federal nonpoint source pollution mandates (e.g., section 313 of the Federal Clean Water Act, Federal Consistency under the Coastal Zone Management Act)
- VDCR's Division of Stormwater Management, Local Implementation Office regarding:
  - Administration of the coastal lands management enforceable policy of the Virginia Coastal Management Program for construction activities involving land-disturbing activities greater than or equal to 2,500 square feet in areas

- Requirement to register for coverage under the general permit for discharges of stormwater from construction activities
- Development of a project-specific stormwater pollution prevention plan. The plan must be prepared prior to submission of the registration statement for coverage under the general permit, and it must address water quality and quantity in accordance with the Virginia Stormwater Management Program permit regulations
- Erosion and sediment control and stormwater management requirements for resource protection areas
- Best management practices for minimizing land disturbance and impervious cover, as well as the protection of native vegetation to the maximum extent practicable

- VDEQ Division of Water Quality Programs, Office of Wetlands and Water Protection/Compliance regarding:
  - Water regulations
  - A variety of permits, including:
    - Virginia Pollutant Discharge Elimination System permit
    - Virginia pollution abatement permit
    - Surface and groundwater withdrawal permit
    - Virginia water protection permit which:
      - Governs wetlands, surface water, and surface water withdrawals/ impoundments; and
      - Serves as § 401 certification of the Federal Clean Water Act § 404 permits for dredge and fill activities in U.S. waters
- Virginia Department of Health, Office of Drinking Water regarding:
  - Reviews projects for the potential to impact public drinking water sources (groundwater wells, springs, and surface water intakes)
  - Requirements and permits related to refuge drinking water sources and facilities
- VDEQ's Division of Land Protection and Revitalization regarding:
  - Solid or hazardous waste management strategies, including items such as facility siting, long-term (20-year) use and alternative programs (e.g., materials recycling and composting)
- Virginia Marine Resources Commission regarding:
  - Projects that involve encroachments channel-ward of ordinary high water along non-tidal rivers and streams, and below mean low water in tidal regions
  - Permit requirements for impacts to tidal wetlands

As needed, we would consider the following recommendations from the VDEQ regarding land-disturbing activities:

- Maximize pervious surfaces and green spaces in the construction design to reduce runoff and the environmental impacts thereof.
- Protect indigenous vegetation to the maximum extent practicable by minimizing land disturbance and impervious cover.
- Meet all erosion and sediment control and stormwater management requirements for all construction activities within Resource Management Areas, as defined by Chesterfield County's ordinance (Chesterfield County Office of Water Quality and Chesterfield County Planning Department 2002).
- The Service or its agents must prepare an erosion and sediment control plan for review by the VDCR Regional Office serving the project area.
- Any soil suspected of contamination, or wastes that are generated during construction, must be tested and disposed of in accordance with applicable laws and regulations, including the Virginia Hazardous Waste Management Regulations (9 VAC 20-60) and the Virginia Solid Waste Management Regulations (9 VAC 20-80).
- The Service or its agents are responsible for determining whether a solid waste meets the criteria for management as a hazardous waste and, therefore, be managed as such.
- Acquire permit(s) from Virginia Marine Resources Commission for projects that will impact tidal wetlands.
- The Service is ultimately responsible for achieving project compliance through oversight of on-site contractors, regular field inspection, prompt action against non-compliant sites, and other mechanisms consistent with agency policy. (VESCL §10.1-567).
- Clearing and grading activities, installation of staging areas, parking lots, roads, buildings, utilities, borrow areas, soil stockpiles, and related land-disturbing activities that result in the disturbance of 2,500 square feet or more of land are regulated by Virginia erosion and sediment control laws and regulations.
- Erosion and sediment controls and best management practices should be inspected and repaired before and after rain events.

Beneficial Impacts
Expansion of the mixed mesic forest via tree plantings on approximately 11 acres along the western boundary of the refuge would increase the riparian corridor width along the James River. This would stabilize the shoreline and reduce erosion and siltation deposition into the James River, resulting in improved water quality and protection from on-refuge activities.

Adverse Impacts
None of our proposed management activities should adversely affect local or regional hydrology and water quality. Public use activities are restricted to areas where only negligible impact would occur. No management activities are planned along the shoreline where direct impacts would most likely occur. No major disturbances of soil are planned, outside of the approved bunkhouse facility. That construction and any maintenance activities would adhere to best management practices for protecting soil and water quality. None would violate Federal or State standards for contributing pollutants to water sources; all would comply with the Clean Water Act.

4.4.2 Hydrology and Water Quality Impacts of Alternative A

Beneficial Impacts
Long-term benefits to hydrology and water quality on the refuge and in the local vicinity would continue from the protection of soils, streams, and other open waters within the refuge boundary. This contribution would however, be negligible, when considered at the James River watershed scale.

Adverse Impacts
There is potential for increased sediment load and deposition into the James River as a result of refuge actions, such as trail maintenance and new, planned facility work. We would implement best management practices to minimize the potential for these refuge actions to have such impacts.

Under alternative A, there are some negligible risks to water quality from herbicide use, in conjunction with invasive plant management. We would minimize that impact by using only approved herbicides, developing and following a spill plan, and using the herbicide as instructed by the manufacturer and according to pesticide use plans approved by the regional contaminants coordinator.

4.4.3 Hydrology and Water Quality Impacts of Alternative B

Beneficial Impacts
Increasing inventory and monitoring activities under alternative B would improve our knowledge of aquatic resources and their relation to water quality and result in more informed management decisions that will have a positive impact on water quality and hydrology.

Adverse Impacts
Under alternative B, most of the impacts would be similar to alternative A with the exception noted below.

Maintenance and operation of the approved classroom and bunkhouse facilities would have a localized and negligible impact on water quality by modestly increasing impervious surface area and through increased wastewater discharge. We would offset these minimal impacts through installation and maintenance of innovative stormwater and wastewater treatment practices. Following best management practices and coordinating with State agencies, as noted above, would also minimize the risk of impact.

4.5 Socioeconomic

For refuge CCP planning, an economic analysis provides a means of estimating how current management (no action alternative) and the proposed management activities affect the local economy. This type of analysis provides two critical pieces of information:

1) It illustrates a refuge's contribution to the local community; and

2) It can help in determining whether economic effects are or are not a real concern in choosing among management alternatives.

It is important to note that the economic value of a refuge encompasses more than just the impacts on the regional economy. Refuges also provide substantial nonmarket values (values for items not exchanged in established markets), such as maintaining endangered species, preserving wetlands, educating future generations, and adding stability to the ecosystem (Carver and Caudill 2007). However, quantifying these types of nonmarket values is beyond the scope of this study.

The refuge management activities of economic concern in this analysis are:

- Refuge purchases of goods and services within the local community
- Refuge personnel salary spending
- Spending in the local community by refuge visitors
- Revenues generated from refuge revenue sharing

4.5.1 Socioeconomic Impacts That Would Not Vary by Alternative

Beneficial Impacts
Socioeconomic benefits would vary between the two alternatives, as described below.

Adverse Impacts
Socioeconomic impacts would vary between the two alternatives, as described below.

4.5.2 Socioeconomic Impacts of Alternative A

Beneficial Impacts
Under alternative A, Presquile NWR would continue to contribute minimally to the economy of Chesterfield, Henrico, Hopewell, Prince George's, and Charles City Counties. Contributions would continue to be in refuge and visitor expenditures in the local communities, and the purchase of goods and services for refuge activities.

The refuge would also continue to meet a specialized area of public demand in providing wildlife-dependent recreational activities, adding to the quality of life of the local community and other recreationists and wildlife enthusiasts in the region.

Adverse Impacts
None identified.

4.5.3 Socioeconomic Impacts of Alternative B

Beneficial Impacts
With three staff planned as additions to the Eastern Virginia Rivers NWR Complex, some negligible increase in benefits may result to the local economy in terms of jobs, income, expenditures, and purchases of goods and services for refuge activities.

Maintenance of the classroom facility and bunkhouse would also contribute to the local economy through local expenditures for labor, materials, and services.

Cyrus Brame/USFWS

Earth Day

Under alternative B, once we evaluate proposals in the transportation plan to improve access for wildlife observation, environmental education, and hunting opportunities, the solution should contribute to increased economic benefits to the local economy generated from increased out-of-town visitors and related expenditures.

Additional refuge programs would increase annual visitation to approximately 3,960 visitors compared to alternative A. As a result, local economies would experience minimally increased benefits in terms of retail expenditures for purchasing auto and boat fuel and related expenditures.

Staffing and funding would improve our ability to communicate with the community about the values of Service-owned lands and opportunities for recreation under this alternative.

Adverse Impacts
None identified.

Refuge-specific Impacts

4.6 Soils

Soil is composed of small particles of chemically weathered rock, decaying organic matter, gases, water, and living organisms. The soil layer is one of the most active sites of energy exchange, and it plays a critical role in ecosystem processes such as the carbon, nitrogen, and oxygen cycles. Healthy soils are critical to nutrient cycling and plant productivity on the refuge and must be protected to sustain the variety of wetland, upland, and riparian habitats. Disturbed land or impervious surface could impact refuge soils.

Soils are the structural matrix and nutrient source for plant productivity at the refuge and must be protected to sustain the variety of wetland, riparian, and upland habitats that would meet our habitat and species management goals. Overall, the soils of the refuge are productive and in good condition with low erosion and compaction hazard (NRCS 2011). These soils have no substantive erosion, compaction, or contamination problems. The only exception is the refuge shoreline along the Turkey Island Cutoff which we describe in chapter 2, section 2.11.1. We continue to reduce adverse impacts to soils by limiting public use to designated areas and stabilizing exposed soils along the shoreline through vegetation plantings.

We evaluated and compared the management actions proposed for each of the refuge CCP alternatives on the basis of their potential to benefit or adversely affect upland soils and soils of the refuge's wetland and riparian areas.

We compared the benefits of the alternatives from actions that would protect soils from erosion, compaction, or contamination or that would restore eroded, compacted, or contaminated soils, including:

- Following best management practices for soils protection and containment
- Limiting public access through permits and designating trails
- Plant and maintain vegetation in riparian areas

The potential adverse soil effects of the refuge management alternatives that were evaluated included impacts from:

- Construction and maintenance of buildings (e.g., classroom and bunkhouse), observation platforms, watercraft landings, and interpretive trails;
- Removal of unnecessary structures;
- Habitat management activities, including mowing and prescribed burning which use heavy equipment; and
- Public uses, such as walking on trails and hunting.

4.6.1 Soil Impacts That Would Not Vary by Alternative

Regardless of which CCP alternative we select, we will continue to use best management practices in all activities that might affect refuge soils to ensure that we maintain soil productivity and do not contribute to erosion or sedimentation.

The Council on Environmental Quality requires special consideration of impacts to prime and unique farmlands. Neither alternative would alter the refuge's

prime farmland soils, impact farmland in the refuge vicinity, or the Nation's production of crops.

Beneficial Impacts

Both alternatives would seek to protect refuge soils by keeping the land cover in natural vegetation and to install the least amount of impervious surface necessary. We would continue to plant native tree species to help control erosion along the refuge shoreline.

Meghan Carfioli/USFWS

Nature trail bordering the tidal swamp forest

We would also continue to prohibit public access including fishing from the bank or shoreline, protecting the soils along the shoreline and the steep river escarpment from erosion.

We would also continue to use best management practices to maintain the existing 3.5-mile trail, 550-foot boardwalk and observation platform, and the visitor contact station to minimize soil erosion and compaction. By continuing to limit public access to the refuge by permit only, we would continue to help protect the refuge's sensitive soils.

Adverse Impacts

Both alternatives would continue with the upgrades to the existing classroom facility and the approved bunkhouse construction and maintenance. These activities would result in localized soil disturbance in the administrative area. The classroom facility was formerly a residence and has been in that location for decades. The construction of the planned, new bunkhouse would affect less than 0.2 acres and would be located within the "managed grassland," in an area of existing public uses covering approximately 6 acres. This area supports these and other buildings and is the most disturbed area of the refuge. Because the soils in this area are well drained and not prone to flooding or ponding, we anticipate negligible impacts to refuge soils from the renovation and new construction of the facilities. We would minimize the risk of soil loss by using soil and erosion control best management practices.

Under both alternatives we would use integrated pest management to control invasive plant species. Of the techniques used as part of integrated pest management, mechanical and chemical controls have the greatest potential to affect soils. Mechanical integrated pest management methods that disturb the soil, such as hand pulling or digging, would only be used if we determine that soil disturbance would be minimal and the potential for re-colonization by invasive species is low.

When using chemical integrated pest management controls, we would take all appropriate steps to minimize the potential to contaminate soils or causing runoff into the river when applying herbicide, including using the minimum effective dosage, using application methods that minimize non-target effects, applying during optimal growth stage for effectiveness, applying in optimal weather conditions, and adhering to licensing requirements and other Federal, State, and local regulations. Also, we would only use herbicides approved by the regional contaminants coordinator and only in accordance with approved rate and timing of application.

Off-trail foot traffic, if concentrated, could degrade vegetation, compact soil, and cause water channeling and pooling. Visitors would continue to be required to stay on designated trails, with the exception of approved refuge programs that would be designed to minimize exposing soils. Any areas of concentrated use, such as around the educational facilities, would be monitored for adverse impacts. If impacts are noticed, impact areas will be temporarily closed for restoration.

Impacts to soils are expected to be greater during the growing season due to the greater soil moisture content at that time of year. Hunters, which disperse more widely across the refuge, are accessing the refuge in the fall, outside of the growing season. Typically during hunting season, plant growth is dormant and the ground may be frozen, which significantly minimizes risk to soils from foot traffic. Based on our field observation on the refuge, at the current use level of hunting, impacts to soils (e.g. erosion, compaction) are negligible.

4.6.2 Soil Impacts of Alternative A

Beneficial Impacts
We would continue to provide long-term benefits for soils from protecting 1,329 acres within the approved Service land boundaries, and would from the reduced management activity due to current staff limitations and reduced programs offered to the public.

We would continue to plant and maintain vegetation in riparian areas to help control erosion, specifically planting native trees in up to 20 acres of transitional mixed mesic forest habitat.

Adverse Impacts
Public use and land management activities may result in localized soil compaction or erosion, and minor soil displacement and loss. Service staff would monitor trails to evaluate ongoing impacts and any need to minimize impacts.

Continued mowing and use of prescribed fire as management tools for maintaining the 200 acres of grasslands requires heavy equipment which has the potential to compact soils. We would continue to only operate that equipment in dry conditions and to stay out of seasonally or perennially wet soils, in order to minimize rutting and compaction. A grass roadway, which also doubles as the trail, is approximately 15-feetwide and is the predominate route for heavy equipment transport and travel. Thus, potential impacts are primarily confined to this footprint.

4.6.3 Soil Impacts of Alternative B

Beneficial Impacts
Long-term benefits for soils from land protection would be similar to alternative A.

In addition, under alternative B, we would actively pursue partnerships to reduce erosion and sedimentation to the James River from the Turkey Island cutoff channel which was created by USACE in the 1930s. Specifically, we would work with USACE, which maintains jurisdiction of the right-of-way through the channel and monitors erosion along the channel.

We would also pursue partnerships with the owners of the property on the other side of the channel, opposite the refuge, which is also experiencing similar erosion. By working with USACE and the nearby landowners, we would have the best opportunity to investigate and implement feasible solutions to stabilize the eroding shoreline and reduce sediment in the James River and Chesapeake Bay system.

Adverse Impacts
The proposed increase in interpretive and environmental education opportunities on the refuge would increase visitation to 1,690 people per year for

programs not affiliated with the Ecology School, and increase student visitation for environmental education programming from approximately 200 per year to 2,000 per year. This increase in visitation rates may cause increased soil compaction and erosion over the long term along trails and other access areas. Short-term soil compaction and erosion may also occur from trail maintenance crews, but the impact area would be limited to existing trails. Service staff would monitor trails and access areas to evaluate any impacts as a result of increased use.

With regards to habitat management activities, the major reduction in grasslands habitat management and increased management for transitional mixed mesic forest habitat would virtually eliminate any risk of soil compaction or displacement from heavy equipment used to maintain grasslands on the refuge over the 15-year life of the CCP.

4.7 Freshwater Wetland Habitats and Vegetation

Wetlands management and conservation is a Federal trust responsibility and our highest priority for the refuge, consistent with the original refuge establishment purpose, and our first and foremost CCP goal. We evaluated the management actions proposed for each of the refuge CCP alternatives for their potential to benefit or adversely affect open water and wetland habitats and associated species.

4.7.1 Freshwater Wetland Habitats and Vegetation Impacts That Would Not Vary by Alternative

Beneficial Impacts
Under both alternatives, we would continue to maintain, through minimal intervention, the tidal swamp forest, tidal freshwater marsh, and riverine tidal habitats, including the James River and the associated backwaters and tidal creeks, present on Presquile NWR. We would continue to inventory and monitor for invasive species and implement control measures using integrated pest management.

Because the tidal freshwater marsh on the northern end of the refuge supports populations of the federally threatened sensitive joint-vetch, under both alternatives, we would continue to informally monitor populations of sensitive joint-vetch. We would continue to coordinate with State and other Federal agencies regarding recreational boating on the refuge's tidal creeks near known populations of sensitive joint-vetch and the tidal freshwater marsh vegetation community.

The continued closure of the refuge to waterfowl hunting and shoreline fishing would continue to protect the ecologically sensitive and biologically healthy wetland habitats and associated habitats. Likewise, the restriction of visitors to designated trails only, which are located outside the sensitive wetland habitats, would further protect the tidal freshwater wetlands.

Adverse Impacts
Refuge administrative activities and public uses on the refuge could create some localized adverse impacts to vegetation. Refuge visitors can trample vegetation and potentially introduce invasive plants to adjacent habitat. Restricting public access on the trail network to foot traffic helps limit potential adverse impacts to surrounding vegetation that might result from allowing off-trail access. In addition, the elevated boardwalk, refuge signs, and refuge outreach and education programs require visitors to stay on the trail to minimize disturbance to wildlife and surrounding vegetation. The maintenance of the boardwalk may result in short-term localized effects to wetland vegetation during that activity, but providing a path for users to cross over the wetlands and not through them, greatly reduces any long-term adverse effects to wetlands habitat and vegetation from human activity.

Some refuge management and restoration projects, including invasive species control, would have short-term negative impacts on vegetation, such as removal of plants, herbicide use, trampling, and other damage to the plants structure. These would be off-set by providing long-term benefits to the diversity and health of the refuge's native plant communities.

4.7.2 Freshwater Wetland Habitats and Vegetation Impacts of Alternative A

Beneficial Impacts
Tidal swamp forest habitat would be improved through continuing to conduct small scale planting efforts of green ash and bald cypress. These species would increase native plant species diversity and provide future nesting and foraging habitat for priority refuge resources of concern.

Adverse Impacts
Alternative A offers minimal opportunity to monitor the ecological integrity of the wetlands habitats given the limited number of refuge staff and difficult access. As a result, under this alternative, we would conduct infrequent and informal monitoring of both invasive plant species and rare plant species. Our ability to use adaptive management in the face of climate change and other landscape-scale issues, such as the sedimentation in the James River, is limited under alternative A.

4.7.3 Freshwater Wetland Habitats and Vegetation Impacts of Alternative B

Beneficial Impacts
In addition to the management that would occur under alternative A, under alternative B, we would increase monitoring and data collection, and provide early detection and rapid response to changes in habitats due to invasive species, global climate change, or storm events, which may result in more success with maintaining and restoring the ecological integrity of the habitats.

We would expand partnerships to offer more opportunities to address erosion and sedimentation issues in the James River, as well as conduct monitoring and research, to be benefit the ecological integrity of the wetland habitats on the refuge.

Adverse Impacts
Same as the impacts that do not vary between alternatives.

4.8 Upland Habitats and Vegetation

The grassland and forested habitats of the refuge provide diverse habitat components to support breeding birds and other wildlife. We evaluated the benefits and adverse impacts of the management actions under the two alternatives on upland habitats. We considered the benefits from:

- Conserving upland areas within the refuge's acquisition boundary
- Promoting forest succession
- Providing a white-tailed deer hunting program
- Expanding upland forests, to include former farm field

We considered the potential for adverse impacts from:

- Mowing, using prescribed fire, and applying herbicides to maintain grasslands
- Maintaining trails and other visitor facilities
- Increased visitation associated with JRA education programs
- Overbrowsing by deer

4.8.1 Upland Habitat and Vegetation Impacts That Would Not Vary by Alternative

Regardless of the alternative selected, we use standard and effective habitat management techniques to conduct forest, shrubland, and grassland management activities in the refuge uplands. These best management practices would protect sensitive habitat components such as vernal pools and species of conservation

concern nesting sites. Whenever practicable, we will replace nonnative plant species with native species to restore the ecological integrity of the refuge.

The refuge will use certain tools to help maintain, enhance, or restore wildlife habitat:

- Replanting with native species
- Prescribed fire, although its use would be minimal under alternative B
- Mowing
- Applying herbicides to control invasive species
- Reducing the deer herd and overbrowsing impacts through hunting
- Disking (only in former farm field with a blade that is smaller than eight inches)

As needed, we would consult with the following offices to be protective of upland habitats and associated wildlife in the refuge vicinity:

- VDCR Natural Heritage Program
  - Regarding natural heritage conservation sites and natural area preserves
- VDGIF:
  - To ensure compliance with protected species legislation
  - Regarding bald eagle concentration areas
  - Regarding bald eagle protection guidance
  - Regarding colonial waterbird colony protection guidance
- VDGIF and Virginia Marine Resources Commission:
  - Regarding Anadromous Fish Use Area protection guidance
  - To obtain updated information from the Center for Conservation Biology's Virginia Bald Eagle Information Web site *(http://www.ccb-wm.org/virginiaeagles/eagleData.php;* accessed May 2012)
- Virginia Endangered Plant and Insect Species Program staff within the Virginia Department of Agriculture and Consumer Services cooperates with the Service, VDCR Division of Natural Heritage, and other agencies and organizations:
  - Regarding the recovery, protection, and conservation of listed, threatened, or endangered species and designated plant and insect species that are rare throughout their worldwide ranges

Beneficial Impacts
Under both alternatives, we would continue to maintain the refuge land in a mosaic of managed grassland, river escarpment, transitional mixed mesic forest, or mature mixed mesic forest habitats. We would manage, primarily via mowing, a grass cover type around buildings, trails, and outside meeting areas. We would

continue to implement best management practices to minimize any potential adverse impacts to upland habitats that are adjacent to the managed area. Under both alternatives, we would use integrated pest management to control invasive species.

Both alternatives would continue to allow the deer hunt. Reducing the deer herd would result in positive, indirect effects on vegetation. The impacts of dense deer populations on forest regeneration and the composition and diversity of the herbaceous understory have been well documented (Tierson et al. 1966, Behrend et al. 1970, Tilghman 1989) on the refuge. The refuge deer hunt will at least maintain the habitat as it is now and prevent further degradation due to overbrowsing. Well-managed hunting can effectively control deer and produce dramatic positive changes in the forest vegetation (Behrend et al. 1970) by allowing better regeneration of forest canopy species and an increase in the diversity of the herbaceous understory. In summary, there will be few, if any, negative impacts from hunting on the refuge's vegetation, and the deer reduction would decrease the level of deer browse on the refuge's vegetation.

Adverse Impacts
Refuge administrative activities and public uses on the refuge could cause some localized adverse impacts to vegetation. Refuge visitors can trample vegetation and potentially introduce invasive plants to adjacent habitat. Plants in the process of growth and producing flowers, and growing in wet or moist soils, are the most sensitive to disturbance from trampling effects (Kuss 1986). Restricting public access on the trail network to foot traffic helps limit potential adverse impacts to surrounding vegetation that might result from allowing off-trail access. The established, native surface trails are all in upland areas where soils and vegetation are dry. In addition, the elevated boardwalk in wetlands, and refuge signs and outreach and education programs, require visitors to stay on the trail to minimize disturbance to wildlife and surrounding vegetation.

Some refuge management and restoration projects, including invasive species control, would have short-term negative impacts on desirable vegetation, such as trampling, to the plants structure. These would be offset by providing long-term benefits to the diversity and health of the refuge's native plant communities.

4.8.2 Upland Habitat and Vegetation Impacts of Alternative A

Beneficial Impacts
Under alternative A, we would continue informal monitoring of invasive plant species and control of known populations of Johnsongrass in the managed grassland and privet and tree-of-heaven in the river escarpment. Our control methods include herbicides, brushing and mowing, hand pulling, and very limited use of prescribed fire. We would also continue to plant native tree species on up to 20 acres in the transitional mesic mixed forest. These management actions are intended to restore the ecological integrity of the upland habitats. Reducing invasive species and increasing native plant species composition would provide nesting and foraging habitat for priority refuge resources of concern.

Adverse Impacts
Due to the staff availability constraints, our ability to effectively restore disturbed upland areas, stabilize eroded steep banks, control invasive species, and manage large grassland areas would continue to be limited.

4.8.3 Upland Habitat and Vegetation Impacts of Alternative B

Beneficial Impacts
Under alternative B, we would convert approximately 177 of the existing 200 acres of grassland/old field habitat to transitional mixed mesic forest habitat, increasing that habitat type from 20 acres to 197 acres on the refuge. There are several reasons we propose this change. Those reasons include:

- The species mix in the grassland is dominated by nonnative species (e.g., orchard grass, fescue grass, and clovers, with some areas overgrown with Canada thistle, Johnsongrass, crabgrass, and rye).
- This grassland species mix is not the preferred mix for grassland nesting birds, or as their foraging habitat, thus making only a marginal contribution to their diversity and productivity.
- This grassland species mix is difficult to manage through periodic mowing.
- Prescribed fire is not an effective management tool to maintain quality grasslands on this refuge based on our past efforts.
- A mixed mesic forest is more suited to the refuge site capability (topography, slope, elevation, soil type, moisture, and water nutrient level) and to the native vegetation of the region.
- Over time, the mature forest habitat block size would increase and improve wildlife connectivity between the mature mesic mixed forest and wetland and riparian habitats.

Under alternative B, approximately 46 acres of existing, managed grassland would continue to be maintained around the administrative and educational complex, and would provide opportunities to integrate small projects (e.g., a pollinator garden and BayScaping with native plants) into the expanded environmental education programs.

The acreage of mature mixed mesic forest under alternative B would remain the same as under alternative A (46 acres). This habitat would be diversified by planting tree species native to this habitat type, such as American beech, tulip-poplar, oaks, and hickories.

Under alternative B, we would place a greater emphasis on restoring and maintaining the ecological integrity of the upland habitats, including inventory, monitoring, and control of invasive plant species; planting of native species; and developing an index of ecological integrity for the upland habitats.

The expanded partnerships proposed under alternative B would provide a greater opportunity for long-term improvements in watershed and river stewardship that would benefit the upland habitats extending beyond the refuge boundaries.

Adverse Impacts
Alternative B would result in converting 177 acres of grassland to transitional mixed mesic forest, reducing the acres of grassland habitat by approximately 80 percent, thereby, reducing some of the vegetative diversity on the refuge. However, the existing grasslands are poor-quality habitat since they are dominated by cool season grasses such as orchard grass and fescue, dominated by invasive plants, and do not provide high-quality nesting and foraging bird habitat. In addition, we struggle each year to manage the existing large grasslands due to the logistics of getting equipment and staff onsite, and due to site capability.

However, we would manage grasslands around administrative facilities on approximately 46 total acres, increasing the footprint of the maintained administrative area, in response to the planned new bunkhouse facility and to provide travel-ways between buildings. Any adverse impacts from increasing

managed grassland are offset by shifting the remaining 177 acres to a more natural mixed mesic forest habitat.

4.9 Species of Special Concern

Although bald eagles have been delisted, it is State-listed and remains a trust responsibility for the Service. We and our partners are committed to protecting, managing, and monitoring habitat for this species. By adhering to the time-of-year restrictions provided in the joint Service-State guidelines, we ensure that activities on the refuge are protective of roosting, nesting, and wintering bald eagles.

We are also committed to protecting the federally threatened sensitive joint-vetch by working with partners to identify additional field survey work needed to inform refuge management and public uses in the vicinity.

We would continue to support research efforts by the NOAA, VCU, and JRA that are related to the federally endangered Atlantic sturgeon in the James River.

We evaluated the management actions we proposed in the alternatives for their potential to benefit the endangered and threatened species by protecting them or their potential habitat. The benefits we considered include:

- Protecting sensitive joint-vetch populations and their habitats
- Providing access to Service lands, facilities, and support for Service and partners conducting research on Atlantic sturgeon in the James River
- Supporting biological monitoring for both Atlantic sturgeon and sensitive joint-vetch

The potential adverse effects of the alternatives that we evaluated included impacts from:

- Recreation facilities or construction projects that might affect species habitats
- Public activities near and on the refuge that might damage habitat or disturb threatened and endangered species

In addition to evaluating the effects of our proposed actions on Federal species of concern, we are working with our Virginia Ecological Services Field Office to conduct an intra-Service section 7 consultation to ensure compliance with the Endangered Species Act (16 U.S.C. 1536) on all actions in this draft CCP/EA.

4.9.1 Species of Special Concern Impacts That Would Not Vary by Alternative

Beneficial Impacts
Both alternatives would comply with approved national guidelines for minimizing impacts to bald eagles (USFWS 2007c) and follow the guidelines approved by the Service and VDGIF (USFWS 2003). Nesting and foraging habitat for bald eagles would continue to be protected and maintained. Seasonal public access restrictions to areas with known and probable eagles nest would be maintained, which would continue our efforts to minimize the probability of disturbance from human activities to nesting bald eagles. We would also continue to provide a buffer, by maintaining the existing forested vegetation between eagle nests and areas where human access is most likely to occur, and to preclude allowed activities during the nesting season.

Suitable habitat for the federally threatened sensitive joint-vetch would continue to be provided by preserving tidal freshwater marsh habitat and protecting this habitat from human use impacts. Similar to our protection of bald eagles, we

would continue to restrict public access, including hunters, to these areas where the plant is known to occur. We would also continue to monitor these sites, which would allow us to ensure compliance with restrictions and address any instances of non-compliance.

We would continue to support efforts by our Fisheries Program Office and other partners to maintain and restore the federally listed Atlantic sturgeon populations. That support includes participating in ongoing habitat improvements and monitoring of species status in the area with Federal, State, and other entities.

Coordinating with State partners to share information and discuss management recommendations for each of these species would continue to occur, helping to maintain coordinated efforts to protect and maintain these species with special status.

Adverse Impacts
The control of invasive plant species has the potential to cause some short term impacts with the use of herbicides to tidal freshwater marsh habitat occupied by sensitive joint-vetch. However, this would be offset by careful use of such herbicides by applicators trained in native plant and target species identification and by the long-term benefits to tidal freshwater marsh habitat by removing and controlling invasive plants and maintaining and restoring native vegetation. All herbicide use will adhere to best management practices and follow approved applications reviewed by the Service's regional contaminants coordinator.

All public use activities, including hunting, would continue to be restricted from areas where bald eagles are concentrated or nesting, or where sensitive joint-vetch is present in order to prevent or minimize disturbance to bald eagles and to prevent degradation to sensitive join-vetch plant communities. However, there remains a concern with unauthorized access which we would attempt to minimize with increased law enforcement outreach.

4.9.2 Species of Special Concern Impacts of Alternative A

Beneficial Impacts
Same as the impacts that do not vary between alternatives.

Adverse Impacts
Same as the impacts that do not vary between alternatives.

4.9.3 Species of Special Concern Impacts of Alternative B

Beneficial Impacts
Under alternative B we would have increased resources, through proposed increases in staff and expanded partnerships, to monitor populations of federally listed species and their habitats such as the endangered Atlantic sturgeon and threatened sensitive joint-vetch. Through assistance from partners and volunteers, we would have a greater ability to respond timely with appropriate management actions.

Adverse Impacts
Increased visitation could potentially result in added off-trail usage impacts and disturbance to bald eagles and sensitive joint-vetch. Service staff would monitor usage to prevent or correct any unauthorized off-trail use or added disturbance that might influence nesting bald eagles or the population of sensitive joint-vetch.

4.10 Birds

We evaluated the management actions we proposed in the alternatives for their potential to benefit the bird species by protecting them or their potential habitat. The benefits we considered included:

- Protection and restoration of native habitats
- Reduction in invasive plants

The potential adverse effects of the alternatives that we evaluated included impacts from:

- Increased visitation
- Invasive species control activities

4.10.1 Bird Species Impacts That Would Not Vary by Alternative

Regardless of the alternative selected, we would continue to focus on riparian restoration, conducting landbird surveys, and managing public use to ensure protection of sensitive nesting areas.

The refuge will use certain tools to help maintain, enhance or create wildlife habitat:

- Native tree plantings in uplands and escarpment
- Public access closures and restricting access to designated areas, such as trails

Beneficial Impacts
Preservation of 738 acres of tidal swamp forest, managing 46 acres of mixed mesic forest, and maintaining 20 acres of transitional mixed mesic forest would continue to provide important breeding and migratory stopover habitat for priority refuge resources of concern such as prothonotary warbler, bald eagle, rusty blackbird, and other forest breeding landbirds.

Preservation of 189 acres of tidal freshwater marsh would also provide important breeding and migratory stopover habitat for waterfowl such as American black duck, wood duck, and waterbirds of conservation concern such as the American bittern.

We would continue to coordinate with the VDGIF and VDCR Natural Heritage Program to share information on wildlife populations and habitat management, especially regarding protection of State endangered species. We would also increase partnerships and the use of volunteers and citizen scientists to collect information on species of concern.

Wood duck

USFWS

Under both alternatives we would continue to maintain the closure of waterfowl hunting around the refuge, providing protection to migratory waterfowl, wetland, and waterbird species that use tidal swamp forest, tidal freshwater marsh, and riverine habitats on the refuge. This order was published in the *Federal Register* on August 19, 1954 (19 FR 5290; codified at 50 CFR 32.8).

We would continue to restrict visitor access to designated areas surrounding known bald eagle nest sites during the breeding season, as well as sensitive areas during the wintering season. Through partner support, we would also continue to maintain the approximately 320 prothonotary warbler nest boxes on the refuge along the major internal streams and along the southeast edge of the island, and support the long-term breeding studies conducted by VCU on the refuge.

Under both alternatives, we would continue to prohibit public access into the tidal wetland and riverine habitats to minimize disturbance to nesting, migrating, and overwintering birds.

Adverse Impacts
We expect minimal disturbance to breeding and migrating birds from trail maintenance, invasive species control activities, mowing, and other management activities. Most adverse impacts are expected to be indirect and short term, such as temporary reduction of cover and food resources in localized areas. As discussed in the soil and water quality sections, the types of chemicals used on the refuge must be approved annually by the integrated pest management coordinator prior to use, and expected to have a minimal effect on fish and wildlife species. Only herbicides approved by the regional contaminants coordinator would be used, and only in accordance with approved rate and timing of application. We would apply herbicides using best management practices.

Some disturbance to breeding birds is likely from public use of the refuge. Disturbance can cause shifts in habitat use, abandonment of habitat, and increased energy demands on affected wildlife (Knight and Cole 1991). Trail use can disturb wildlife outside the immediate trail corridor (Trails and Wildlife Task Force 1998, Miller et al. 2001). Miller et al. (1998) found bird abundance and nesting activities (including nest success) increased as distance from a recreational trail increased in both grassland and forested habitats. Bird communities in this study were apparently affected by the presence of recreational trails, and associated human activity, where common species (e.g., American robins) were found near trails, and rare species (e.g., grasshopper sparrows), were found farther from trails. Songbird nest failure was also greater near trails (Miller et al. 1998).

Humans walking off trail have been shown to cause greater disturbance (greater area of influence, flush distance, and distance moved) to wildlife than walking within trail corridors (Miller et al. 2001). Predictability of disturbance (on trail versus off trail) has been cited as a major factor in impacts to wildlife. Walking off trail is considered less predictable to wildlife and typically more disruptive (Knight and Cole 1991, Trails and Wildlife Task Force 1998, Miller et al. 2001).

Noise impacts on birds are variable depending on the intensity and duration of the noise, as well as the auditory range of the animal itself. A study of wintering bald eagles found that human activities such as boating and fishing could disturb the birds (especially adults). Normally occurring sounds were not particularly disturbing, although acute noise (such as gunshots) elicited escape behavior (Stalmaster and Newman 1978). Another study of bald eagles found human pedestrian activity was more disturbing than overflights by aircraft (Grubb and King 1991). At a study conducted on a national wildlife refuge in Florida, researchers found that waterbirds such as the sora, glossy ibis, little blue heron, and tricolored heron were disturbed by the presence of visitors and that loudness

was as significant of a disturbance as the number of people in this effect (Burger and Gochfeld 1998).

Birds that occupy the periphery of the refuge may be more likely affected by human activity and associated noise. During certain times of the year, such as summer and weekends, recreational boat traffic may periodically contribute to the soundscape and disturb birds and other wildlife. Fortunately, most recreational boaters use the Turkey Island Cutoff to travel both up and downriver, which currently has limited value for wildlife. Barge traffic is also restricted to the Turkey Island Cutoff. The majority of the refuge is bordered by an oxbow of the James River, but due to channel depth and longer distances, the oxbow around the majority of the refuge sees significantly less motorized recreational boat traffic. Silent boat traffic such as canoeists and kayakers represents a greater risk to disturbing wildlife along the majority of the refuge's shoreline and interior streams.

Requiring visitors to stay on the 3.5 miles of trails, the boardwalk, and in the managed grassland areas where the facilities are located will help minimize these disturbance impacts. Environmental education programs, which would contribute to the majority increase in visitation, would be specifically designed to minimize disturbance to nesting birds and other sensitive areas (see appendix B, compatibility determination for wildlife observation, photography, environmental education and interpretation, for stipulations). Also, the most sensitive nesting areas, including bald eagle nesting areas, would continue to be restricted from public access. For example, the guidelines developed by the Service and VDGIF that would restrict access and activities during the nesting season from December 15 to July 15 and create a 1,320-foot buffer around each nest (USFWS 2003).

4.10.2 Bird Species Impacts of Alternative A

Beneficial Impacts
Maintaining natural vegetation along the James River and associated backwaters would sustain important migratory stopover and overwintering habitat for waterfowl including Canada goose, mallards, and American black duck.

Maintaining 200 acres of grassland with scattered shrubs and other woody vegetation would provide a small amount of marginal breeding habitat for landbirds of conservation concern dependent on early successional and grassland habitats, such as grasshopper sparrow, field sparrow, American woodcock, and northern bobwhite. Concerns with consistent management of this habitat to set back succession and control invasive plants would continue to be a concern and is discussed in more detail below.

Adverse Impacts
Except for the existing effort by VCU on prothonotary warbler, our ability to monitor population trends or habitat relationships of priority species of conservation concern is minimal under alternative A. This limits our ability to measure the effectiveness of our management actions, such as invasive species removal, native plantings, and public access closures, on migratory birds.

Limited resources and the challenging logistics of getting equipment to the island has made management of the 200 acres of grassland inconsistent from year to year. This inconsistency has resulted in conditions that only marginally support grassland nesting birds of conservation concern known to nest on the refuge, such as grasshopper sparrow and field sparrow. Grasshopper sparrows prefer grasslands of intermediate height and are often associated with clumped vegetation interspersed with patches of bare ground, and sparse woody vegetation. They are area-sensitive and prefer large grassland areas, where at

least 75 acres of quality habitat may be needed to support a breeding population (Dechant et al. 2004). We are unable to manage habitat as recommended, that is, actively creating a mosaic of grassland successional stages, including sparse patches and few woody stems, across large fields (Dechant et al. 2004).

The challenges with managing quality field sparrow habitat would be similar to that for grasshopper sparrows in that control of invasive plants and excessively dense woody stems would continue to be difficult to avoid. However, field sparrows would generally benefit for a longer period of time as fields lay untreated due to their preference for woody edges along moderately tall grasslands (Dechant et al. 2004), woody stems for singing perches, and the fact they are less area sensitive than grasshopper sparrows.

4.10.3 Bird Species Impacts of Alternative B

Beneficial Impacts

Similar to alternative A, maintaining natural vegetation along the James River and associated backwaters would sustain important migratory stopover and overwintering habitat for waterfowl including Canada goose, mallards, and American black duck.

The conversion of 177 acres of grassland to mature mixed mesic forest would result in an initial transitional shrub stage, which would benefit priority refuge birds of concern such as the prairie warbler, field sparrow, and American woodcock. This transition would provide benefits for up to 20 years to those and other species that utilize early successional forest habitat. Under alternative B, we would also work with partners to conduct landbird monitoring that would provide feedback on the impact of our management activities on priority bird species of conservation concern. We could then adapt management in response in a more timely and effective manner.

Beyond the timeframe of this CCP, the eventual conversion of grassland to mature mixed mesic forest would benefit a different suite of species such as scarlet tanager and wood thrush, and for other species of conservation concern such as Louisiana waterthrush and other forest breeding landbirds. We would further enhance the habitat for these species by planting a more diverse mix of native forest species. We would also strive to actively maintain the 11 acres of forested river escarpment to increase and sustain habitat for species of conservation concern that benefit from forested shoreline habitat, such as bald eagles, great blue herons, and other wading birds that use trees for nesting and perches.

Under alternative B, we would conduct proposed baseline surveys and inventories for birds to increase our baseline knowledge and understanding of bird populations. This would help us better quantify effects on birds on Service-owned lands.

Adverse Impacts

The transition of 200 acres of grassland to mixed mesic forest would reduce available habitat for migratory Canada geese on the refuge, as well as for grasshopper sparrow, field sparrow, American woodcock, and northern bobwhite. With regards to Canada geese, based on banding data, migratory Canada geese have decreased substantially in the past 10 years along the Atlantic coast, and resident geese have been increasing in the surrounding agricultural landscape. Given the shift in goose populations and the change in the refuge grasslands toward taller grasses and more shrubs, the refuge has become less important for sustaining migratory geese, and resident geese are not suffering from population declines. Regarding the other grassland birds mentioned, we previously noted that the existing grasslands habitat, due to the extensive presence of invasive

plants, its relatively small size for area-sensitive grassland birds, and our inconsistent capability to actively manage it in an early successional stage, provides only marginal quality habitat for most grassland birds of conservation concern.

Short-term, temporary impacts to bird species utilizing the refuge would likely result from human presence on trails and from research activities; however, the requirement to stay on designated trails, and stipulations in the permit to allow research, would minimize the extent and duration of impacts to birds. In addition, the expanded educational programming is intended to raise awareness and build a stewardship ethic among the school-aged population, thus building long-term support for, and understanding of, migratory birds.

Increased visitation from Service-sponsored programs and activities could potentially result in added off-trail usage impacts and disturbance to birds as a result of these uses. Service staff would monitor usage to prevent or correct any unauthorized off-trail use or added disturbance that might negatively impact bird nesting.

4.11 Fisheries

We compared the management actions in the alternatives based on their potential to benefit or adversely affect the refuge's native warmwater fishery, including actions to help maintain and improve the water quality of the James River, the refuge wetlands, and the watershed. We evaluated the actions that would benefit the fishery by reducing sedimentation and erosion, protecting or restoring riverine functions influenced by vegetation and hydrology, and by maintaining or improving water quality. These actions include:

- Implementing best management practices to reduce sediment load and deposition
- Maintaining and expanding vegetated riparian areas and natural habitats
- Improving water quality monitoring for early problem identification
- Improving cooperation with other landowners and coordination with Federal and State partners to influence water quality in the watershed and protect fisheries and aquatic resources
- Developing and implementing an inventory and monitoring plan

We compared the impacts of these refuge management actions with the potential to cause adverse effects on the fishery, particularly by altering refuge hydrology or degrading water quality. The actions we evaluated include:

- Applying herbicides to manage invasive species
- Using prescribed fire to manage grasslands
- Trail and facility construction and maintenance activities

4.11.1 Fisheries Impacts That Would Not Vary by Alternative

Beneficial Impacts
Under either alternative, we would continue to implement best management practices to minimize the potential for refuge actions (e.g., trail and facility construction and maintenance activities) to increase sediment load and deposition in the James River, thereby minimizing impacts to fisheries habitat.

We would maintain and expand vegetated riparian areas and natural habitats, which would prevent riverbank erosion. It would also provide organic matter in the form of dead leaves and branches, which would support benthic macroinvertebrates, a food source for many fish within the James River.

We would continue to work with partners such as the James Riverkeeper to monitor the two water quality stations, to improve our understanding of the water quality of the James River near the refuge. This effort would also increase our ability to identify and appropriately respond to changes in pollutant levels within the river.

We would also support partner efforts (e.g. JRA, VDGIF, and the National Marine Fisheries Service) to restore and monitor spawning habitat for Atlantic sturgeon, a federally listed endangered species, which would potentially improve the reproductive success of this species within the James River.

We would continue to work with State partners on outreach, education, and law enforcement related to fisheries and aquatic resources on and in surrounding areas of the refuge.

Adverse Impacts
When using chemical integrated pest management controls, we would take all appropriate steps to minimize the potential to contaminate soils when applying herbicides, including using the minimum effective dosage, using application methods that minimize non-target effects, applying during optimal growth stage for effectiveness, and adhering to licensing requirements and other regulations. Also, we would only use herbicides approved by the regional integrated pest management coordinator and only in accordance with chemical label instructions in regards to rate and timing of application.

Sedimentation from erosion and land disturbing activities would potentially adversely affect fish species by degrading habitat quality on the refuge. By implementing best management practices associated with construction and land disturbing activities and working with our partners (e.g. JRA, VDGIF, and USACE) to address the eroding river escarpment, we would minimize these impacts to fish species.

4.11.2 Fisheries Impacts of Alternative A

Beneficial Impacts
Same as the impacts that do not vary between alternatives.

Adverse Impacts
Same as the impacts that do not vary between alternatives.

4.11.3 Fisheries Impacts of Alternative B

Beneficial Impacts
In addition to the benefits that do not vary between alternatives, under alternative B, we would implement an inventory and monitoring plan, which would improve our understanding of refuge aquatic habitats and the impacts of our management actions on those habitats and the species dependent on them. This would ultimately improve our effectiveness in providing fisheries habitat and our ability to adapt to management activities to address impacts of climate change.

Adverse Impacts
Same as the impacts that do not vary between alternatives.

4.12 Mammals

We compared the management actions in the alternatives based on their potential to benefit or adversely affect the refuge's mammals. As described in chapter 2, field mice are the most abundant mammals found in all refuge habitat types. Deer, raccoon, gray squirrel, woodchuck, eastern cottontail rabbit, striped skunk,

and muskrat are common mammals for this part of Virginia and may be found on the refuge. Little brown bat, red fox, and beaver are known to live on the refuge (Jackson et al. 1976, USFWS 2004a). River otter have also been observed in the area. We suspect that bobcat and coyote may also be on the island, as they are in the surrounding area, but to date, do not have conclusive observations. With the exception of the bat and concerns with white-nose syndrome, none of these species known to occur and breed on the refuge are of elevated conservation concern.

4.12.1 Mammal Impacts That Would Not Vary by Alternative

Beneficial Impacts
Under either alternative, we would continue to coordinate with State partners to share information about mammals of conservation concern. This collaboration on research results would result in more informed decisions to protect native mammals, and any mammals of conservation concern should they be subsequently found on the refuge, and to affect the conservation of these mammals throughout the region.

Adverse Impacts
The use of herbicides as part of invasive species management can sometimes cause negative impacts to some mammals, especially small rodents, who may be physically impacted during application, may be affected by loss of cover, or may be highly sensitive to the chemical compounds used. We would continue to make every effort to minimize use and application of herbicides and other integrated pest management techniques unless determined to be the most effective technique to reduce potential impacts on mammal populations.

Disturbance by hunting may negatively affect non-target mammals. However, significant disturbance to these species is unlikely for the following reasons. Small mammals, including bats, are generally less active, and may be inactive, during hunting season. Interactions with hunters are predicted to be rare.

Other public use activities may cause disturbance for mammals, as noted under the discussion on birds. Seasonal sensitivities can compound the effect of disturbance on some wildlife. For example, causing mammals to flee during winter months has been documented to cause them to consume large amounts of stored fat reserves. Hammitt and Cole (1998) also noted that females with young (such as white-tailed deer) are more likely to flee from a disturbance than those without young. Year-round trail use may disturb wildlife during sensitive periods of their life cycle. However, by requiring visitors to stay on designated trails and outside of sensitive areas, this disturbance will be minimized.

4.12.2 Mammal Impacts of Alternative A

Beneficial Impacts
Presquile NWR would continue to provide the diversity of habitats at current levels to support the variety of mammals noted above and described in chapter 2.

Adverse Impacts
Same as the impacts that do not vary between alternatives.

4.12.3 Mammal Impacts of Alternative B

Beneficial Impacts
Converting 177 acres of grassland through a combination of planting and natural succession to a shrubby transitional mixed mesic forest would increase habitat connectivity between the mature mixed mesic forest and tidal swamp forest habitats of the refuge and provide corridors for travel and movement for certain mammals, namely benefitting the larger mammals which could hide more readily.

Increased knowledge and understanding of mammal populations resulting from various surveys and inventories conducted under alternative B would help us better quantify the status and trends of mammals on the refuge. For example,

the size and health of the deer herd would be assessed to determine if any necessary management actions, beyond the existing hunt program, would be required to protect their population and the habitats of the refuge.

Adverse Impacts
Under alternative B, 177 acres of grassland habitat would be converted to transitional mixed mesic forest. Those mammals that favor non-forest habitats, such as field mice, cottontail rabbits, skunk, and red fox, would have their habitat reduced proportionately.

Short-term, temporary impacts would result from the increased human presence on trails and with increased research activity; however, the requirement to stay on trails and stipulations in special use permits would minimize the extent and duration of impacts.

Increased visitation could potentially result in added off-trail usage impacts and disturbance as a result of use. Service staff would monitor usage to prevent or correct any unauthorized off-trail use or added disturbance that might influence impacts on native mammals.

4.13 Amphibians and Reptiles

4.13.1 Amphibian and Reptile Impacts That Would Not Vary by Alternative

We compared the management actions in the alternatives based on their potential to benefit or adversely affect the refuge's amphibians and reptiles. Riparian forests and wetlands along the James River provide excellent breeding and foraging habitat for many amphibian and reptile species. In chapter 2 we describe the species known on the refuge, including snapping turtle, brown water snake, black racers, eastern painted turtle, eastern red-eared sliders, green tree frogs, spring peepers, Fowler's toads, southern leopard frog, and green frog. All are relatively common and widespread; however, we are concerned about general declines in amphibian populations across their range. Appendix A lists the reptile (12 species) and amphibian (6 species) species of conservation concern that likely occur on Presquile NWR, including the spotted turtle, eastern box turtle, and barking treefrog.

Beneficial Impacts
We would continue to protect amphibian and reptile populations through maintenance of habitats that afford hibernation, foraging, and breeding habitat on the refuge. Upland forests on the refuge are particularly valuate for the eastern box turtle, while forested wetland and riparian areas are important for spotted turtles.

Concentrating public use and activities also affords more areas for these species to be undisturbed. In addition, invasive plant control to promote native plant food species would be beneficial. Studies have shown that gray tree frogs declined in body mass and weight where habitats were degraded by invasive species and that invasive *Phragmites*, over time, can change the hydrology in high marshes (Blossey 1999, Blossey and Maerz 2002 unpublished).

Adverse Impacts
Grassland maintenance, which would occur under both alternatives, may have direct negative effects on amphibians and reptiles. Mowing grassy areas occasionally destroys turtles, snakes, or frogs, if conducted during times of movement (warm months). The best way to minimize that type of direct negative impact is to keep these areas mowed short so they are not attractive to most species, and also to mow in the heat of the day when turtles have retreated to the

cool forest. The use of herbicides as part of invasive species management may also cause negative impacts to some amphibians and reptiles. During application, the use of heavy machinery or transporting people could crush species in the way. Also, reptiles or amphibians in close proximity to dispersal of herbicides might get covered. In all cases we use only herbicidal products and surfactants approved by the Service's regional contaminants coordinator. We also follow strict application procedures to minimize impacts. We would continue to make every effort to minimize use and application of integrated pest management techniques to reduce potential impacts on the amphibian and reptile populations.

Similar to mammals, there may be disturbance from hunters who travel off-trail. However, this is expected to be rare as hibernation or torpor by cold-blood reptiles and amphibians limits their activity during the hunting season when temperatures are low. Hunters would rarely encounter reptiles and amphibians during most of the hunting season due to the time of year and the relatively few days the refuge is open to hunting.

4.13.2 Amphibian and Reptile Impacts of Alternative A

Beneficial Impacts
Presquile NWR would continue to provide the diversity of habitats at current levels to support the variety of amphibians and reptiles noted above and in chapter 2. The benefit to reptiles and amphibians that require grasslands would be slightly greater under alternative A due to the fact more grasslands (a total of 200 acres) would be maintained compared to alternative B (46 acres), creating more edge habitat that benefit snakes and other reptiles. The abundant food resources (e.g., insects, small mammals) in grasslands are important for many reptiles and some amphibians, particularly in older fields with a rich diversity of plant and invertebrate life and complex soils and fields adjacent to woodlands with ample cover. The beneficial impacts are the same as those noted above.

Adverse Impacts
Compared to alternative B, there is an increased risk of the direct impacts associated with grassland management as noted above due to the fact that more acres (200 grassland acres) would be maintained, while alternative B proposes only 46 acres of very short grassland be maintained.

4.13.3 Amphibian and Reptile Impacts of Alternative B

Beneficial Impacts
Alternative B strives to restore or maintain healthy forested habitats that represent historic natural conditions, and to reduce invasive plants. Over the long term, active management would be reduced as forests would be self sustaining. Thus, potential impacts noted above for grassland habitat management would be much reduced. Also, the increased monitoring of forest conditions and the reptile and amphibian populations present that are proposed under alternative B, would provide us with better information to make decisions benefiting amphibians and reptiles. We would be much better able to quantify the status and trends of the species utilizing the refuge. We would plan to use volunteers and partners to obtain more information on species presence and help inform our management.

Converting 177 acres of grassland through a combination of planting and natural succession to a shrubby transitional mixed mesic forest would dramatically increase habitat connectivity between the mature mixed mesic forest and tidal swamp forest habitats of the refuge and enhance corridors for wildlife to travel. Compared to alternative A, alternative B would support 177 more acres of mixed mesic forest. Larger tracts of forest and forested wetlands are more likely to contain vernal pools, which are important for many breeding amphibians. Upland habitats adjacent to wetland habitats are important for frogs, toads, salamanders, and wetland turtles as they forage in upland habitats, but lay their eggs in

wetlands. Overall, alternative B would benefit those reptile and amphibian species that require forested habitats.

Adverse Impacts
Under alternative B, grassland habitat would be reduced as a result of the conversion to transitional mixed mesic forest; however, the refuge would still provide 46 acres of managed grassland for administrative and educational purposes. Those reptile and amphibian species that prefer open habitat would be impacted by the reduction of grasslands and old field.

Short-term, temporary impacts would result from the increased human presence on trails and with increased research activity; however, the requirement to stay on trails and stipulations in special use permits would minimize the extent and duration of impacts.

Increased visitation could potentially result in added off-trail usage impacts and disturbance as a result of non-compliance with permit conditions. Service staff would monitor impacts adjacent to trails and shorelines to prevent or correct any unauthorized off-trail use or added disturbance that might influence impacts on native amphibians and reptiles.

4.14 Invertebrates

4.14.1 Invertebrate Impacts That Would Not Vary by Alternative

We compared the management actions in the alternatives based on their potential to benefit or adversely affect the refuge's invertebrates. This taxon is the least studied and understood group of animals on the refuge. A full range of aquatic insects, butterflies, beetles, and other species would be easily found during the warmer seasons. Butterfly species, such as monarch, red admiral, sulphurs, buckeye, painted lady, and eastern tiger swallowtail, are some of the more common butterfly species known on the refuge. No rare or listed insect species were collected during a 2002 Natural Heritage Inventory conducted by the Virginia Division of Natural Heritage.

Beneficial Impacts
Under either alternative we would continue to monitor and manage invasive plant and animal species, including invasive invertebrates, which could result in environmental harm, such as causing the decline of native invertebrate species and disruption of environmental processes.

We would work to continue the maintain native plants as a result of our land management practices, which would sustain vegetation diversity, and in turn, likely improve available habitat for invertebrates. Maintaining native plants is particularly important for native pollinator species and would reduce competition from invasive pests associated with those undesirable plants.

Adverse Impacts
The use of herbicides as part of invasive species management can sometimes cause negative impacts to some invertebrates. We would continue to make every effort to minimize use and application of integrated pest management techniques to reduce potential impacts on invertebrate populations.

Impacts from hunting would be similar to those described for amphibians and reptiles. Basically, impacts would be negligible given that hunting typically occurs in colder weather when invertebrates are inactive.

4.14.2 Invertebrate Impacts of Alternative A

Beneficial Impacts
Compared to alternative B, alternative A would provide a greater benefit to invertebrates that require grassland habitats, especially those that prefer old field habitats.

Adverse Impacts
Same as the impacts that do not vary between alternatives.

4.14.3 Invertebrate Impacts of Alternative B

Beneficial Impacts
Increased knowledge and understanding of invertebrate populations resulting from Service or partner-led inventories would help us better quantify the effects on invertebrate species on the refuge.

Adverse Impacts
Under alternative B, grassland habitat would be reduced as a result of the conversion to transitional mixed mesic forest; however, 46 acres of managed grassland would be maintained for administrative and educational purposes, including a small demonstration native planting areas focusing on invertebrate pollinator habitat. It should be noted, however, that most of these 46 acres will be intensively managed, more like a lawn, and would be low quality habitat due to lack of diversity in composition and structure.

4.15 Cultural Resources

4.15.1 Cultural Resources Impacts That Would Not Vary by Alternative

Regardless of the alternative, the Service is responsible for managing and protecting cultural resources found on national wildlife refuges. The consequences of past, current, and proposed management on known cultural resources are the same across all alternatives. Any management actions with the potential to affect cultural resources would require review by the refuge manager, as well as review by the Service's RHPO in consultation with the State of Virginia SHPO, as mandated by section 106 of National Historic Preservation Act, and with Tribal representatives. Therefore, determining if particular actions within an alternative have the potential to affect cultural resources is an ongoing, well-established, and regulated process that would occur during the planning stages of any proposed projects. The difference between the alternatives below has to do with continued investigations, outreach, and interpretation of cultural resources.

As needed, we would consult with the following groups/offices to be protective of cultural resources in the refuge vicinity:

- Department of Historic Resources to:
  - Determine if project implementation would generate an effect on historic structures or cultural resources under its jurisdiction;
  - Ensure compliance with Section 106 of the National Historic Preservation Act of 1966, as amended; and
  - Implement regulation at 36 CFR 800.
- Tribal organizations

As needed, we would consider the following recommendations from the RHPO and SHPO regarding land-disturbing activities:

- Work would be stopped in the area of any discovery if construction unearths previously undiscovered archaeological resources
- The Service would consult with the SHPO/Tribal Historic Preservation Officer and the Advisory Council on Historic Preservation, as necessary, according to 36 CFR 800.13, Post Review Discoveries.
- In the unlikely event that human remains are discovered during construction, provisions outlined in the Native American Graves Protection and Repatriation Act would be followed as appropriate.

Meghan Carfioli/USFWS

Bunkhouse construction site

Beneficial Impacts
Known archaeological sites and cultural resources and landscape would continue to be protected from unintended impacts. We would continue to increase our knowledge, understanding, and appreciation of the refuge's cultural resources and rich history as part of the James River region.

Adverse Impacts
Land-disturbing activities such a new construction and native vegetation planting have the potential to adversely impact the cultural resources of the refuge. We would implement recommendations outlined in the 2009 Archaeological Overview Study to minimize disturbance and prevent loss or degradation of cultural resources (Goode et al. 2009) and would coordinate with SHPO and other partners.

4.15.2 Cultural Resources Impacts of Alternative A

Beneficial Impacts
Impacts would be similar to those mentioned above. Any known cultural resources or known archaeological sites at Presquile NWR would continue to be protected through outreach and enforcement activity to avoid unintended impacts.

Adverse Impacts
Same as the impacts that do not vary between alternatives.

4.15.3 Cultural Resources Impacts of Alternative B

Beneficial Impacts
In addition to the benefits under alternative A:
We would expand our understanding of the presence of archaeological, historical, and cultural resources by completing a formal Phase I field investigation to identify and define the boundaries of archeological resources within the refuge. We would also conduct a walkover survey of the entire refuge to evaluate ground surfaces, locate landscape features (fence lines or roads), and find evidence of previous settlements.

We would work with the RHPO and Tribal Representatives to develop and sponsor a proactive, National Historic Preservation Act Section 110 initiative at the refuge, which involves identifying and investigating vulnerable archaeological sites and other cultural resources, and inventorying any discovered archaeological resources.

We would form partnerships with the SHPO, Tribal representatives, USACE, and other stakeholders with cultural resource interests and Federal trust responsibilities to develop strategies that emphasize prevention and mitigation of significant cultural resource loss, if a significant site is present and is at risk of natural or human-made degradation.

The significant cultural resources on the refuge would be promoted through signage and interpretation and working with partners such as the NPS on the Captain John Smith Chesapeake NHT activities in the James River. We would also considering developing interpretive trails to further enhance the visitor experience.

Cultural resource protection efforts would be integrated into other refuge programs, such as cultural resource interpretation and education, increasing their exposure to visitors. We would increase resources to help prevent visitor impacts to cultural resources, including designating public access and use areas where impacts to cultural resources would be avoided, and creating and installing signage at the refuge that states it is illegal to disturb, collect, or remove cultural resources.

Adverse Impacts
To prevent impacts to known resources, we would monitor sites on a regular basis for looting and trespass.

4.16 Public Use and Access

The 1997 Refuge Improvement Act identified six priority, wildlife-dependent public uses that should receive enhanced consideration when planning on national wildlife refuges. Those six uses are hunting, fishing, wildlife observation and photography, and environmental education and interpretation. All except fishing are activities provided on Presquile NWR under certain stipulations.

4.16.1 Public Use and Access Impacts That Would Not Vary by Alternative

Regardless of the alternative selected, we will regulate access in order to limit impacts on environmental integrity and habitats and manage points of entry into the refuge. The refuge will use certain tools to help, such as advanced permitting, designate Service-sponsored activities, and partner assistance. We would continue to provide five of the six priority public uses on the refuge, with primary emphasis on environmental education. Public access would still require a special use permit in advance, unless a visitor is engaged in a refuge or partner-sponsored program. All of the existing trail and wildlife observation facilities would be maintained.

Beneficial Impacts
Under both alternatives we would support wildlife observation, photography, interpretation, and environmental education according to the approved compatibility determination; support public deer hunting as currently allowed; maintain and enforce closed waters for waterfowl hunting; and continue to prohibit recreational fishing from refuge shoreline to minimize conflicts with other resource and management objectives, such as shoreline erosion.

We would work with VDGIF to promote opportunities for public waterfowl hunting and fishing in waters off refuge lands allowed by State regulations. Through this effort we would direct recreationists to areas that can accommodate waterfowl hunting and shoreline fishing with minimal impact.

Adverse Impacts
Continuing to maintain the permit system for public access when not involved in a refuge-sponsored event requires visitors to plan at least three business days in advance prior to visiting the refuge. We feel that this system allows for us to maintain contact with visitors and their intended uses; provide educational opportunities; enforce natural, cultural, and asset protection; and protect the nature of the experience at Presquile NWR. Permit requests would only be denied due to requests for incompatible uses.

4.16.2 Public Use and Access Impacts of Alternative A

Beneficial Impacts
Presquile NWR would continue to provide opportunities for five of the six priority public uses allowed to the same degree that they are currently allowed.

Adverse Impacts
Same as the impacts that do not vary between alternatives.

4.16.3 Public Use and Access Impacts of Alternative B

Beneficial Impacts
Increased offerings, enhanced quality, and increased number of potential participants in environmental education programs offered would result in local and regional, minor to moderate, beneficial impacts on program participants. Through our partnerships with the JRA and others, our environmental education program offerings on- and off-refuge would increase the potential to achieve our goal of inspiring appreciation and stewardship of the refuge in relation to the James River watershed, Chesapeake Bay Estuary, and the Refuge System.

Our expanded and enhanced interpretive programs and media would result in local and regional, minor beneficial impacts on audiences served. Through our partnerships with the NPS, JRA, and others, we would increase the potential to achieve our goal of providing opportunities for visitors to enjoy and connect with nature, while also developing an enhanced understanding and appreciation for the refuge's natural and cultural resources. For example, visitors engaging in the Captain John Smith Chesapeake NHT tours in the James River Oxbows focus area would be afforded opportunities to view landscapes that are largely undeveloped, hear and see native wildlife and plants, and imagine what life was like for Native Indians and early European settlers. Our efforts would promote a deeper understanding of America's diverse peoples and inspire refuge stewardship by telling a more complete story of the area's significance in the past, present, and future.

Offering public deer hunting opportunities on the refuge would continue to generate minor to moderately beneficial impacts for the hunting community. Our efforts to explore opportunities to enhance the public deer hunt quality and work in partnership with VDGIF have the potential to generate additional benefits for existing deer hunters, as well as a larger number of hunters of all ages. However, since the number of hunting opportunities on the refuge is limited by the huntable acreage and diversity of potential future hunting opportunities, we do not anticipate that the impacts of hunting on Presquile NWR would constitute major benefits to the local, regional, State, or national contexts.

Adverse Impacts
To address any potential impacts from increased visitors, a visitor services plan would be developed to monitor activities to assess visitor use, numbers, and impacts; visitor satisfaction; capacity limits; and visitor understanding and support for Refuge System and refuge purposes, and whether that leads to stewardship actions.

To address any impacts from an expanded hunt program, the visitor services plan would also include monitoring activities to assess hunter satisfaction and capacity limits.

4.17 Cumulative Impacts

According to the Council on Environmental Quality regulations on implementing NEPA (40 CFR 1508.7), a cumulative impact is an impact on the environment that results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions, regardless of what agency (Federal or non- Federal) or person undertakes the other actions. Cumulative

impacts can result from individually minor but collectively significant actions taking place over time.

Our cumulative impacts assessment includes the actions of other agencies or organizations, if they are interrelated and influence the same environment. This analysis considers the interaction of activities at the refuge with other actions occurring adjacent to the refuge and over a larger state and regional spatial and temporal frame of reference

4.17.1 Air Quality

Air quality is generally good in the refuge vicinity, despite the fact that the refuge is within the Richmond-Petersburg Metropolitan Statistical Area (MSA) for nonattainment of ground-level ozone. It should be noted that in 2010, the EPA proposed two changes that would alter the existing ground-level ozone standards for the Richmond-Petersburg MSA (VDOT 2011). The first would be strengthening the eight-hour "primary" ground-level ozone standard by lowering it to within the range of 0.06 to 0.07 ppm to protect human health. The second change would be establishment of a "secondary" standard to protect sensitive vegetation and ecosystems, including forests, parks, wildlife refuges, and wilderness areas. The EPA's proposal to establish more stringent ground-level ozone standards for this Richmond-Petersburg MSA would be directly beneficial for the protection of refuge resources in the short and long term. Furthermore, the continued protection of the island as a national wildlife refuge would contribute noticeably toward the protection of air quality in the MSA overall and in the area where a "secondary" standard would apply.

None of the actions proposed in this CCP would alter the nonattainment status of the MSA for ground-level ozone. Actions proposed in this CCP would be implemented in accordance with all applicable standards and practices for the protection of air quality, including following guidance provided to control dust and adherence to permit requirements when required for fuel-burning activities. Protection, restoration, and enhancement of native vegetation should generate beneficial impacts to air quality locally. These beneficial impacts will derive from the refuge's capacity to continue to filter out many air pollutants harmful to humans, wildlife, and the environment. We would develop our proposed transportation system improvement plan to ensure conformity with the approved State Implementation Plan for air quality, a requirement originating from Section 176(c) of the Clean Air Act, as amended (VDOT 2011). We will also strive to reduce energy consumption with green infrastructure and products associated with refuge activities.

In addition, with the new Service goal of achieving carbon neutrality by 2020, the refuge will be undertaking aggressive efforts to reduce the energy use and carbon footprint of our buildings, facilities, vehicle fleet, and workforce to the maximum extent possible. We will also be exploring ways to offset our residual carbon footprint by increasing carbon sequestration through our habitat management activities, especially afforestation projects. Integrating carbon sequestration awareness into conservation actions for wildlife and other habitat management activities will also have cumulative beneficial impacts for the air quality and humans within the local environment.

In summary, none of the actions we propose under either alternative are expected to contribute to regional exceedences of Federal Clean Air Act air quality standards, and no Class I air quality areas would be affected.

4.17.2 Water Quality

All surface waters in the refuge vicinity are classified as 303(d)-listed impaired waterways. None of the actions proposed in this CCP would alter that classification for any waterways in the refuge vicinity. Actions proposed in this

CCP would be implemented in accordance with applicable standards to prevent further degradation of water quality in the refuge vicinity, including development of an approval of sediment and erosion control plan for land-disturbing activities. Protection, restoration, and enhancement of native vegetation should generate beneficial impacts to water quality locally. These beneficial impacts will derive from the refuge's capacity to continue to filter out many water pollutants harmful to humans, wildlife, and the environment. We would develop our proposed shoreline management plan and refuge step-down plans to ensure conformity with Virginia's approved watershed implementation plans, special requirements for the James River, and county ordinances (Chesterfield County Office of Water Quality and Chesterfield County Planning Department 2002, VDCR 2012).

In accordance with Executive Order 13514, Energy Independence and Security Act, and Executive Order 13508, all Federal facilities are required to demonstrate leadership and commitment to controlling pollution, leveraging their expertise and resources to contribute significantly to improving the health of the Chesapeake Bay. We would enhance contact with Virginia State agencies to take all actions necessary to ensure that receiving waters are not negatively impacted by activities on the refuge. Water quality protection of wetlands and waterways of the Chesapeake Bay would be included in environmental education and interpretive programs offered both on and off the refuge. Our efforts would contribute to the overall beneficial impacts on water quality in the refuge vicinity, James River watershed, and Chesapeake Bay Estuary.

In summary, none of the activities proposed under either alternative would contribute to adversely affecting local or regional hydrology and water quality. No proposed activities would violate Federal or State standards for contributing pollutants to water sources and all would comply with the Clean Water Act.

4.17.3 Biological Integrity, Diversity, and Environmental Health

None of our proposed management activities should adversely affect biological integrity, diversity, and environmental health either individually or when considered along with other activities on other ownerships in the region. In fact, our management actions strive to benefit and sustain these ecosystem components. The 1997 Refuge System Improvement Act states that in administering the Refuge System, the Service shall "…ensure that the biological integrity, diversity, and environmental health of the System are maintained."

Biological integrity refers to the composition, structure, and function of habitats and communities or ecosystems and the natural processes that shape them. Biological diversity is the variety of all living things. Environmental health encompasses the structure, function, and health of soil, water, air, and other abiotic elements. We based our proposed actions on consideration of other Federal, State, and conservation partner management plans after determining how the refuge could best contribute to the regional conservation landscape. In evaluating our impacts in this section, we considered how we would affect perpetuating, maintaining, or restoring the biological integrity, diversity, and environmental health of the refuge.

Under both alternatives, we would work with partners across James River watershed to protect biological integrity through maintaining and restoring native habitats and ecological communities, and actively controlling invasive plants and animals. We would continue prevent the transportation of invasive plants elsewhere on the refuge by using best management practices, continuing to survey for invasive species, controlling existing populations, and educating the public about these invaders. For those refuge projects that have regional implications, we will serve as a demonstration area and work with our partners to establish a long-term monitoring program. Data and information will be shared to monitor the regional implications of climate change.

Wildlife species diversity would be maintained through native habitat protection and restoration, limiting public access into sensitive habitat areas, and protecting and restoring habitats for federally listed species and species of conservation concern. Many of our conservation partners in the area are engaged in similar activities, and collectively, this has resulted in gains to certain wildlife populations. Coordinated management, research, and monitoring along the lower James River has benefitted populations of nesting bald eagles and wading birds, as well as breeding migratory landbirds such as the prothonotary warbler.

With regard to environmental health, we would ensure that refuge activities do not affect hydrological or soil processes and impact water quality in the lower James River. Refuge activities would be closely monitored that have the potential to impact soils. We would continue to work with partners to monitor water quality in the James River and document any concerns. We would also continue our work to restore the river escarpment habitat from erosion, which contributes sediment deposition to the James River and Chesapeake Bay systems.

When visitors come to the refuge, we would continue to promote and demonstrate best management practices and a conservation ethic in hopes that visitors will go back to their local communities and effect positive change.

4.17.4 Socioeconomic Resources

None of the actions proposed in this CCP would alter the classification of the refuge lands as undeveloped, conservation land in the draft Conservation Plan for Chesterfield County, currently being developed. We expect beneficial impacts on the socioeconomic environment would result from maintaining and enhancing wildlife populations, improving native wildlife habitats, and protecting the biological integrity, diversity, and environmental health of refuge lands, which sustain and provide numerous ecosystem services that benefit wildlife and humans. We anticipate contributing beneficially to the growing residential community and visiting public's appreciation for natural areas and understanding of our collective stewardship responsibilities to protect areas of notable natural and cultural importance.

The human population and employment are expected to grow 45 percent and 46 percent, respectively, by 2035 in the Ruffin Mill area. The Ruffin Mill area is currently a rural and suburban area, located along the I-295 corridor and west of the refuge (MPO 2012). The expected population and employment growth will be supported by the recently completed Meadowville Technology Park industrial complex and its I-295 interchange. The master plan for Meadowville Technology Park includes biotech/pharmaceutical facilities, research and development centers, and semiconductor manufacturing (*http://www.meadowville.com/conceptual_plan.asp*). We anticipate this population increase would result in an increased interest in, and use of, existing public lands and recreational areas in the vicinity, including Henricus Historical Park, Dutch Gap Conservation Area, and Presquile NWR. A portion of this increased recreational demand may be accommodated by the Captain John Smith Chesapeake NHT experiences on land and water.

We anticipate increased motorized boating in deeper waters adjacent to the refuge and increased kayaking and canoeing in the tidal creeks within the refuge. Through our partnership with the NPS and JRA to offer environmental education and interpretive programs associated with the Captain John Smith Chesapeake NHT in the James River Oxbows focus area (NPS 2011). The refuge is the only site within this focus area that offers visitors a glimpse into the past, where sights and sounds of the modern world are minimal or completely absent. Inclusion of the refuge in the Captain John Smith Chesapeake NHT adds a special, unique opportunity of the natural environment that American Indians and European settlers would have experienced. It is essential that we

continue to collaborate with the NPS on implementation of the Captain John Smith Chesapeake NHT to ensure the protection of refuge resources for their enjoyment by future generations.

Our working relationships with existing partners and new partners would improve in terms of responsiveness to inquiries and speed of joint projects under alternative B. That improvement mainly would result from the increased staffing in key areas such as biology, public use, and maintenance. The overall coordination and communication with the public would improve under alternative B, because a new staff position would deal with public use and public information.

An increased emphasis on environmental education in alternative B would foster greater understanding and appreciation of the refuge's natural and cultural resources at the local and regional levels, and potentially lead to increased support and funding to support for partner-sponsored environmental education and interpretive programming. Ultimately, these efforts would benefit fish and wildlife resources on the refuge in the long term. The increased outreach of these alternatives could also positively affect land use decisions outside the refuge by local governments and private landowners, and lead to increased fish and wildlife populations over a broader area.

4.17.5 Biological Resources

Both of the alternatives would maintain or improve Service trust resources and other native wildlife and plants in the region, although to varying degrees. As discussed in section 1.4, a wide variety of existing national, regional, and local plans and priority guidance documents directly influenced development of the biological resource management objectives in this draft CCP/EA. The combination of our management actions with other organization's actions could result in significant, beneficial cumulative effects to biological resources by:

- Increasing the conservation and management of federally and State-listed threatened and endangered species and other species of concern and associated habitats, through protection and maintenance of ecologically important uplands and wetlands;
- Using adaptive management and the best science available to manage and promote regionally important habitats and natural communities;
- Controlling invasive plants and animals that are not native to the area; and
- Partnering with JRA and others to offer educational and interpretive programs that help children understand issues related to the biological integrity and environmental health of the James River and the Chesapeake Bay, and foster their interest in stewardship of those resources.

Below we highlight particular Service activities that have the potential to cumulatively affect biological resources in the region.

Native Plants and Wildlife
Acquiring necessary information to monitor native wildlife habitats and species would add to the body of knowledge the Service would collect and share with other conservation partners, leading to a beneficial influence on and improve of natural resource decisions, resulting in cumulative benefits on the biological environment over a broader landscape. In general, native habitat management would contribute beneficially to the biological environment as we expect to enhance the quality of habitats for native species of priority refuge wildlife of concern. Native plant management cumulatively benefits the biological environment by increasing and enhancing healthy soil biota, restoring and enhancing native plant resources, increasing resident wildlife populations of

mammals, fish, reptiles, and amphibians, and enhancing invertebrate production to sustain and perpetuate migratory bird resources.

Invasive Plants and Animals
Certain biological resources that we would manage to control, prevent, or eliminate (i.e., invasive plants and animals) are not native components to habitats on the refuge. We do not consider the loss of these biotic elements to be an adverse impact. However, not controlling invasive on the refuge would contribute adversely to the local biological environment. Alternative B also has stronger biological monitoring components with increased efforts in surveying wildlife species and habitats and research coordination with others.

Controlling exotic and invasive plants may involve the use of chemical herbicides. The selective use of herbicides will be based upon an integrated pest management strategy that incorporates pest ecology, the size and distribution of the population, site-specific conditions, known efficacy under similar site conditions. Best management practices will reduce potential effects to non-target species, sensitive habitats, and quality of surface and groundwater. Herbicide applications will be targeted to control discreet pest populations in localized areas. Herbicides applied on the refuge would be short-lived, resulting from environmental and microbial breakdown to less or non-hazardous degradation products.

Public Use
The land use immediately adjacent to the refuge is agricultural, residential, and industrial. As described under section 4.17.3, the anticipated population and employment increases by 2035 would likely result in an increased demand for public use may have cumulative impacts on the biological environment. The management objectives presented in the alternatives are our attempts to strike a feasible balance that ensures the refuge effectively protects the biological environment for the long term, while offering wildlife dependent recreational opportunities on the refuge.

Public deer hunting results in the direct loss of individual wildlife. However, not hunting deer on the refuge would contribute adversely to the local biological environment. We describe the site-specific impacts of the public hunting programs earlier in this chapter and in appendix B.

Cumulative impacts from research activities are not expected, but could occur if multiple research projects were occurring on the same resources at the same time or if the duration of the research was excessive. We describe the site-specific impacts of the biological research earlier in this chapter and in appendix B.

4.17.6 Cultural Resources

Overall, both of the alternatives would contribute beneficially toward protection of cultural resources on the refuge, although to varying degrees.

Under alternative B:

- We expect beneficial impacts of implementing recommendations provided in the archaeological overview (Goode et al. 2009) for Presquile NWR would complement efforts by the SHPO and RHPO to protect cultural resources throughout the State and the Refuge System;

- Our proactive approach to Section 110 compliance would contribute an additional, noticeable increment to the overall effort by the SHPO and RHPO to protect cultural resources on refuges. Presquile NWR would become one of the few refuges in the Service's Northeast Region taking a proactive approach toward cultural resource protection; and

- We expect beneficial impacts to derive from improved partnerships for the interpretation of the refuge's cultural landscape within the context of the Captain John Smith Chesapeake NHT. In partnership with the NPS, JRA, and others, we would offer opportunities for the public to experience these landscapes while instilling an ethic for cultural resource protection and stewardship to ensure their enjoyment by future generations.

4.17.7 Climate Change

Department of the Interior Secretarial Order 3226 (January 16, 2009) states that, "There is a consensus in the international community that global climate change is occurring and that it should be addressed in governmental decision making…This Order ensures that climate change impacts are taken into account in connection with Departmental planning and decision making." Additionally, it calls for the incorporation of climate change considerations into long-term planning documents, such as this CCP.

The Wildlife Society published a technical review report in 2004 titled "Global Climate Change and Wildlife in North America" (Inkley et al. 2004). The Wildlife Society report interprets results and details from such publications as the IPCC reports (1996 to 2002) and describes the potential impacts and implications on wildlife and habitats. It mentions that projecting the impacts of climate change is hugely complex because not only is it important to predict changing precipitation and temperature patterns, but more importantly, to predict their rate of change, as well as the exacerbated effects of other stressors on the ecosystems. Those stressors include loss of wildlife habitat to urban sprawl and other developed land uses, pollution, ozone depletion, exotic species, disease, and other factors.

The effects of climate change on populations and range distributions of wildlife are expected to be species specific and highly variable, with some species benefiting and others vulnerable to extirpation or extinction. Generally, the prediction in North America is that the ranges of habitats and wildlife will generally move upwards in elevation and northward as temperature rises (Inkley et al. 2004, Rodenhouse et al. in press). However, The Wildlife Society report emphasizes that developing precise predictions for local areas is not possible due to the scale and accuracy of current climate models, which is further confounded by the lack of information concerning species-level responses to ecosystem changes, their interactions with other species, and the impacts from other stressors in the environment.

To help meet the climate change challenge, the Service drafted a *Climate Change Strategic Plan* (USFWS 2009b). The plan employs three key strategies to address climate change: adaptation, mitigation, and engagement. The Association of Fish and Wildlife Agencies developed guidance for states as they update and implement their respective wildlife action plans (AFWA 2009). This publication "Voluntary Guidance for States to Incorporate Climate Change into State Wildlife Action Plans and Other Management Plans" also includes strategies that will help conserve fish and wildlife species and their habitats and ecosystems as climate conditions change. The broad spatial and temporal scales associated with climate change suggest that management efforts that are coordinated on at least the regional scale will likely lead to greater success.

Our review of proposed actions in this CCP suggests that two activities may contribute negligibly to stressors affecting regional climate change: our grassland maintenance program, which includes mowing and our use of vehicles and equipment for refuge management and administration. We discuss the direct and indirect impacts of those activities elsewhere in chapter 4. We also discuss measures to minimize the impacts of both. With regards to our equipment and facilities, we are trying to reduce our carbon footprint wherever possible by using alternative energy sources and energy saving appliances, driving hybrid vehicles, and using recycled or recyclable materials, along with reduced travel and other

conservation measures. Because Presquile NWR is an island and access is limited to boats and other watercraft, vehicle use on the refuge is limited to what is necessary to maintain administrative facilities and the trail system.

Grassland habitat management activities such as mowing occur every one to three years. Our prescribed burn program is dormant due to ineffectiveness in obtaining the desire habitat conditions under the amount of time and resource cost. Under alternative B, we would reduce the amount of mowing required to maintain grassland habitat on the refuge by allowing 177 acres to succeed to shrub and then eventually a forested cover type. Planted and naturally established trees would provide long term carbon sequestration. Alternative B outlines the most aggressive measures for addressing climate change by minimizing our carbon footprint and greenhouse gas emissions from management activities, maximizing resiliency of natural communities, and collecting data to understand the effects of climate change on the refuge. In our professional judgment, the management actions we propose would not exacerbate climate change in the region or project area.

The Wildlife Society report provides 18 recommendations to assist land and resource managers in meeting the challenges of climate change when working to conserve wildlife resources (Inkley et al. 2004). Their position is that if land and resource managers collectively implement these recommendations, then cumulatively there would be a positive impact of addressing climate change. We discuss our actions relative to addressing some of these recommendations:

- *Recognize Climate Change as a Factor in Wildlife Conservation*
  The Service is taking a major role among Federal agencies in distributing and interpreting information on climate change. There is a dedicated Web site to this issue at: *http://www.fws.gov/home/climatechange/* (accessed May 2011), which links to the Service's recently released Strategic Plan for Climate Change. The strategic plan includes two key elements: landscape conservation cooperatives and a National Fish and Wildlife Climate Adaptation Strategy; both elements bring together conservation partners to address climate change in a concerted effort. Strategies for adapting to and mitigating climate change are included in this CCP. Specific steps taken by the refuge will help reduce our greenhouse gas emissions, including using energy efficient equipment and vehicles where feasible; building and maintaining any structures using sustainable, green building technologies; conduct energy audits; and other strategies. In addition, we will rely on the habitat and species vulnerability assessments and other climate change research such as the SLAMM model already developed for Presquile NWR (Clough and Larson 2010).

- *Manage for Diverse Conditions*
  The habitat management actions described in chapter 3 are intended to promote healthy, functioning native habitats, to protect biological integrity, and maintain the resiliency within these systems to adapt to changing conditions. We would implement an adaptive management approach as new information becomes available.

- *Do Not Rely Solely on Historical Weather and Species Data for Future* Projections without Taking into Account Climate Change
  Historical climate, habitat, and wildlife conditions are less reliable predictors as climate changes. For example, there may be a need to adjust breeding bird survey dates if migratory birds are returning earlier to breed than occurred historically. Preliminary evidence from VCU's monitoring of prothonotary nest boxes on the refuge indicates a trend that males are returning to the refuge earlier in the spring. We are aware of these implications and plan to build these

considerations into our inventory and monitoring plan and so that we can make adjustments accordingly. Under alternative B, we would incorporate climate change monitoring (such as phenology, timing of bird migrations, flooding regimes, and sea level rise) into our inventory and monitoring plan.

- *Expect Surprises, Including Extreme Events*
  This CCP has incorporated extreme events (such as drought and increasing flood frequency) into future management strategies. We would continue to incorporate new information in future planning with the development of HMP, the inventory and monitoring plan, and the visitor services plan.

- *Reduce Non-climate Stressors on the Ecosystem*
  The objectives of our habitat management program are to maintain and enhance the biological integrity, diversity, and health of refuge lands. Objectives to increase forested covered through allowing the natural forest succession process to continue on the grassland habitats under alternative B and to manage habitats for native vegetation would help maintain resilience in the face of climate change.

- *Maintain Healthy, Connected, Genetically Diverse Populations*
  Small isolated populations are more prone to extirpations than larger, healthy, more widespread populations. Larger tracts of protected land facilitate more robust species populations and can offer better habitat quality in core areas. We would continue to work with our many conservation partners at the State and regional levels to support and complement restoration and protection efforts around the James River and in the Chesapeake Bay watershed.

- *Translocate Individuals*
  It may sometimes be necessary to physically move wildlife from one area to another to maintain species viability. However, this tool has potential consequences and should only be used in severely limited circumstances as a conservation strategy. In the case of Atlantic sturgeon and American shad, the Service supports efforts to bolster population levels through egg-taking, hatchery rearing, and stocking to establish breeding populations in the wild. The Service would support the translocation of other species to establish or restore populations on or near the refuge, if feasible, and evidence would indicate that it would not affect the ecological integrity of the refuge.

- *Protect Coastal Wetlands and Accommodate Sea Level Rise*
  We would continue to work with our conservation partners around the James River and Chesapeake Bay to protect tidal habitats. The tidal freshwater marsh and swamp of the refuge would be inundated by projected sea level rise due to their elevation. Because of this, the refuge may serve as an important indicator for the effects of climate on plants and animals. We would use the information gathered from our monitoring programs to adapt management to reduce the threat and maintain critical natural resources in the James River and Chesapeake Bay.

- *Reduce Likelihood of Catastrophic Events Affecting Populations*
  Increased intensity of severe weather can put wildlife at risk. While the severe weather cannot be controlled, it may be possible to minimize the effects by supporting multiple, widely spaced populations to offset losses. We can help reduce this risk by managing for diverse conditions; biological integrity, diversity, and environmental health; and connected genetically diverse populations. Under both alternatives, the refuge would work with regional partners to conserve and manage sufficient large patches of high quality habitat that are connected by suitable travel corridors. This is a main focus of the Service's newly formed North Atlantic Landscape Conservation Cooperative.

- *Prevent and Control Invasive Species*
  Climate change may increase opportunities for invasive species to spread because of their adaptability to disturbance. Invasive species control will be essential, including extensive monitoring and control to preclude larger impacts. Invasive species control is a major initiative within the Service. The Northeast Region, in particular, has taken a very active stand. In chapter 2, we describe the current extent of invasive species on the refuge and in chapter 3, we include strategies common to both alternatives for controlling existing and future invasive plant infestations. We also describe monitoring and inventorying strategies to protect against any new infestations.

- *Account for Known Climatic Conditions*
  Monitoring key resources through predictable short-term periodic weather phenomenon, such as El Niño, can aid in future management efforts. We plan to develop a monitoring program that would help us evaluate our hypotheses, assumptions, and successes in achieving objectives, as well as help us make future management decisions. Any restoration activities or proactive habitat management actions would be carefully planned and their effectiveness monitored and documented so we can use this information in future management decisions.

- *Select and Manage Conservation Areas Appropriately*
  The establishment of refuges, parks, and reserves is used as a conservation strategy to try to minimize the decline of wildlife and habitats in North America. Decisions on locating future conservation areas should take into account potential climate change and variability. For example, it is suggested that decisions on new acquisitions consider the anticipated northward migrations of many species, or the northern portion of species ranges. Managers of existing conservation lands should consider climate change in future planning. We would continue to work with our conservation partners in the James River and Chesapeake Bay watersheds to identify and protect areas that maintain connectivity and biological integrity in the face of climate change and other stressors.

- *Ensure Ecosystem Processes*
  Managers may need to enhance or replace diminished or lost ecosystem processes. Manually dispersing seed, reintroducing pollinators, treating invasive plants and pests, are examples used. Our habitat goals and associated objectives include an emphasis on maintaining the ecological integrity of intact habitats on the refuge, enhancing habitats through planting diverse native species, allowing natural succession to occur within one of the major habitats, and controlling invasive plant species. Alternative B would maximize this recommendation by protecting and restoring natural processes in most habitats on the refuge.

- *Use Monitoring and Adaptive Management*
  Managers should monitor climate and its effects on wildlife and their habitats and use this information to adjust management techniques and strategies. Given the uncertainty with climate change and its impacts on the environment, relying on traditional methods of management may become less effective. We agree that an effective and well-planned monitoring program, coupled with an adaptive management approach, will be essential to dealing with the future uncertainty of climate change. We have built both aspects into our CCP. We would develop a detailed step-down inventory and monitoring plan designed to test our assumptions and management effectiveness in light of ongoing changes. With that information in hand, we would either adapt our management techniques, or reevaluate or refine our objectives as needed.

4.18 Relationship Between Short-term Uses of the Human Environment and Enhancement of Long-term Productivity

In this section we examined the relationship between local, short-term uses of the human environment and maintaining the long-term productivity of the environment. By long-term, we mean that the impact would extend beyond the 15-year period of this CCP.

Under both alternatives, our primary aim is to maintain or enhance the long-term productivity and sustainability of natural resources on the refuge, in the State of Virginia, and in the Mid-Atlantic ecoregion. The alternatives strive to conserve migratory birds and fish, the federally listed Atlantic sturgeon and sensitive joint-vetch, and other species of concern and the habitats that they depend on. The construction of a bunkhouse for an expanded environmental education program represents a loss of long-term productivity in a relatively small area, although it is on a site already disturbed as part of the existing refuge facilities operations environmental education and interpretation programs supported by the facility would be designed to encourage visitors to be better stewards of our environment and would be used to perform outreach for local, regional, and national conservation issues. Encouraging members of the public, especially school aged children, to support conservation efforts can ultimately lead to long-term benefits for the environment. We believe that our management actions, including control of invasive plant species, allowing the majority of our grassland habitat to succeed to woody vegetation, managing for native vegetation, and enhancing and protecting habitats for rare species such as Atlantic sturgeon and sensitive joint-vetch, would have short-term adverse impacts, but enhance long-term productivity of the refuge. Habitat management practices that mimic ecological and sustainable processes optimize the maintenance and enhancement of the biological diversity, integrity, and environmental health of those habitats for the long term.

In summary, we predict that the alternatives would contribute positively in maintaining and enhancing the long-term productivity of the refuge's natural resources with sustainable beneficial cumulative and long term benefits to the environment surrounding the refuge with minimal inconvenience or loss of opportunity for the American public.

4.19 Unavoidable Adverse Impacts

Unavoidable adverse effects are the effects of those actions that could cause harm to the human environment and that cannot be avoided, even with mitigation measures. Both of the alternatives would result in some minor, localized, or unavoidable adverse effects. For example, any new construction, mowing, or control of invasive species would produce minor, short-term, localized adverse effects. However, none of those effects would rise to a considerable level and these actions would have long-term beneficial impacts. Furthermore, all of those impacts would be mitigated with best management practices, so none of the alternatives would cause significant, unavoidable cumulative impacts.

Some habitat types on the refuge would be reduced (e.g. grasslands) and thereby impacted. Under alternative B, allowing and assisting the woody plant species establishment in the grassland habitat would change the amount of open, grass dominated habitat over the long term. However, this change would likely be gradual and would follow the natural cycle of forest succession in the region (Watts 1999). While the proposed loss of grasslands under alternative B would be intentional, we believe it supports our responsibility is to manage the refuge with an emphasis on maintaining and restoring the ecological integrity and natural processes of the refuge.

As we noted previously, many of the habitat and facility construction projects in the alternatives have a certain level of unavoidable adverse effects, especially during the actual construction. Those effects are mitigated to some degree by the use of practices and precautions that safeguard water quality, avoid sensitive or irreplaceable habitats, or time the actions or include features to avoid or

minimize impacts on fish and wildlife. The adverse effects generally are short-term and more than offset by the long-term benefits to fish and wildlife, habitats, biological integrity and diversity, and environmental health.


Meghan Carfioli/USFWS

Nature trail near the Menenak Discovery Center

Proposed public uses may have unavoidable adverse effects on vegetation, soils, and wildlife. However, we minimize these impacts to the extent possible by allowing only pedestrian use on designated trails (except during hunting), limiting access to less sensitive areas, and minimizing impacts through best management practices in trail use.

The environmental educational program we propose would introduce the most activity and potential to impact resources. Environmental education is one of our primary uses that we are directed through Executive Order 12996. We believe we have sought a fair balance in minimizing and mitigating adverse impacts while optimizing wildlife conservation and also providing excellent environmental education opportunities to the public.

Alternative B would have adverse impacts to a certain segment of the public that does not desire any change in current habitat management or public use programs.

4.20 Potential Irreversible and Irretrievable Commitments of Resources

Irreversible commitments of resources are those which cannot be reversed, except perhaps in the extreme long term or under unpredictable circumstances. An example of an irreversible commitment is an action which contributes to a species' extinction. Once extinct, it can never be replaced. No irreversible commitments of resources are predicted as a result of management activities on Presquile NWR.

In comparison, irretrievable commitments of resources are those which can be reversed, given sufficient time and resources, but represent a loss in production or use for a period of time. In our professional judgment there are a few actions proposed that could be considered irretrievable and primarily relate to the construction of administrative and visitor facilities, such as buildings, and trails. They are considered irretrievable because in the future, any facility we construct could potentially be dismantled and the site restored; however, while standing, they represent a loss in habitat productivity.

We identify the resource impacts of constructing these activities earlier in chapter 4. In our professional judgment, the overall local and regional benefits to the human environment far outweigh the loss of productivity. These infrastructures would be located within an area already heavily disturbed, the new bunkhouse construction would be more energy efficient and designed to recycle resources to the extent possible, and outreach and communications with the public would be greatly facilitated. In summary, we predict that none of these actions would result in a significant impact on the human environment.

4.21 Energy Efficiency

President Obama signed Executive Order No. 13514, "Federal Leadership in Environmental, Energy, and Economic Performance" on October 5, 2009 to establish an integrated strategy towards sustainability in the Federal government and making reductions in greenhouse gas emissions a priority for Federal agencies (USFWS 2008c). The Executive Order requires agencies to achieve a 20 percent reduction in greenhouse gas emission from fiscal year 2008 levels by the year 2020. To demonstrate proactive leadership among government agencies, the Service adopted a commitment to become carbon neutral by 2020 in *Rising to the Urgent Challenge: Strategic Plan for Responding to Accelerating Climate Change* (USFWS 2009b). The Service implements strategies to achieve the goal of carbon neutrality through policy outlined in 565 FW 1 (USFWS 2010b).

Outlined in 565 FW 1 are three categories (minimizing energy use, better planning, and work practices) where Service activities should consider approaches that are sustainable and work towards the goal of carbon neutrality. We have made significant progress recently in rehabilitating a former housing unit on the refuge for use as the LEED-compliant environmental education center, constructing a new low-impact wetland boardwalk in the tidal swamp forest, and planning to construct a new LEED-compliant bunkhouse in support of the Ecology School, and promoting sustainable energy sources.

We will continue to make incremental progress in maintaining and constructing facilities in a manner consistent, to the maximum extent practicable, with the most current guidance. We will continue to identify and remove those structures that have no useful purpose or that pose safety hazards. We must also take care to maintain both new and rehabilitated facilities to Service standards to keep them safe, functional, and attractive.

We continue to service, repair, and maintain existing renewable energy infrastructure as needed. The refuge manager will fully evaluate the alternative energy structures on the refuge and, if necessary, remove them, modify their design, move them to more effective locations and/or add additional infrastructure. The Service remains committed to use of renewable energy sources to the fullest extent feasible on refuge lands.

4.22 Environmental Justice

President Clinton signed Executive Order No. 12898, "Federal Actions to Address Environmental Justice in Minority Populations and Low-income Populations" on February 11, 1994, to focus Federal attention on the environmental and human health conditions of minority and low income populations, with the goal of achieving environmental protection for all communities.

The order directs Federal agencies to develop environmental justice strategies to aid in identifying and addressing disproportionately high, adverse human health or environmental effects of their programs, policies, and activities on minority and low-income populations. The order is also intended to promote nondiscrimination in Federal programs substantially affecting human health and the environment, and to provide minority and low-income community's access to public information and participation in matters relating to human health or the environment.

The EPA Office of Environmental Justice defines environmental justice as follows:

"Environmental Justice is the fair treatment and meaningful involvement of all people regardless of race, color, national origin, or income with respect to the development, implementation, and enforcement of environmental law, regulations, and policies. EPA has this goal for all communities and persons across this

Nation. It will be achieved when everyone enjoys the same degree of protection from environmental and health hazards and equal access to the decisionmaking process to have a healthy environment in which to live, learn, and work" (*http://www.epa.gov/environmentaljustice;* accessed August 2011).

To facilitate this, Federal agencies should also consider if a significant portion of the affected community is linguistically isolated and, as warranted, provide translated documents and other appropriate outreach materials.

In creating table 4.2 below, we used the following definitions:

- Minority population includes persons who identified themselves and members in their households as members of the following groups:
  - One Race: American Indian and Alaska Native; Asian; Black or African American; Hispanic; Native Hawaiian and Other Pacific Islander; White; or some other race.
  - Two or More Races: Any combination of two or more of these race categories.
- Low-income population includes persons living below the poverty line.
- Linguistically isolated population includes persons who speak English less than "very well."

Table 4.2. Regional Environmental Justice Characteristics.

	City of Hopewell[1], Virginia	Chesterfield County, Virginia	Henrico County, Virginia	Charles City County, Virginia
Majority Race Population (as percent of total population)	White 55.4 percent	White 68.3 percent	White 59.2 percent	Black or African-American 48.4 percent
Minority Population[2] (as percent of total population)	44.6 percent	31.7 percent	40.8 percent	51.6 percent
Low-income Population[3] (as percent of total population)	20.4 ± 2.9 percent	5.9 ± 0.6 percent	9.6 ± 0.7 percent	9.7 ± 2.6 percent
Linguistically Isolated Population[4] (as percent of total population)	1.3 ± 1.0 percent	2.2 ± 0.2 percent	2.9 ± 0.4 percent	0.0 ± 1.4 percent

[1] Nearest incorporated city to Presquile NWR, not within any adjacent County.

[2] Minority population includes all races except the majority race, based on total population. Data source is the "QT-P4 Race, Combinations of Two Races, and Not Hispanic or Latino: 2010" tables (USCB 2010).

[3] Low-income population based on the percentage (and percent margin of error) of people whose income in the past 12 months is below the poverty level. Data source is the "DP03 Selected Economic Characteristics: 2008-2010 American Community Survey 5-Year Estimate" tables (USCB 2010).

[4] Linguistically isolated population based on the percentage (and percent margin of error) of households. Data source is the "S1602 2005-2009 American Community Survey 5-Year Estimates" tables (USCB 2010).

Minority, low-income, and linguistically isolated populations are present in the vicinity of Presquile NWR (USCB 2010). We believe, based on our socioeconomic and environmental consequences analysis, that neither of our proposed alternatives would place a disproportionately high, adverse environmental, economic, social, or health effects on minority or low-income persons because:

- The CCP/EA planning team actively solicited public participation as part of the planning process and gave equal consideration to all input from persons regardless of age, race, income status, or other socioeconomic or demographic factors.

- Implementation of the proposed alternatives would not result in any identifiable adverse human health effects. Therefore, there would be no direct or indirect adverse effects on any minority or low-income population.

- The impacts associated with implementation of the proposed alternatives would not disproportionately affect any minority or low-income population or community.

- Any impacts to the socioeconomic environment would not appreciably alter the physical and social structure of the nearby communities.

Beneficial impacts include maintaining natural vegetation that improves air and water quality through filtering, paying refuge revenue sharing payments to the town of Charles City to offset property tax loses, and providing enhanced and free public uses under alternative B.

Before we make any decisions to make major changes in habitat management or the environment we always inform all of our publics, equally, and our programs and facilities are open to all who are willing to adhere to the established refuge rules and regulations. We do not discriminate in our responses for technical or practical information on conservation issues or when providing technical assistance in managing private lands. Additionally, all refuge uses proposed under the alternatives would be open to all members of the public. The Service is also an equal opportunity employer.

4.23 Summary of the Impacts of the Alternatives

The following table 4.3 summarizes the benefits and adverse impacts we described above in chapter 4 for specific resources or programs proposed for Presquile NWR under both of the alternatives. For our discussion on cumulative impacts, the relationship between short-term uses of the human environment and enhancement of long-term productivity, unavoidable adverse impacts, potential irreversible and irretrievable commitments of resources, and environmental justice, please refer to the chapter 4 narratives above.

Table 4.3. Summary of Environmental Consequences by Alternative

Resource or Program	Alternative A Current Management	Alternative B Service-preferred Alternative
Air Quality	Beneficial Impacts That Would Not Vary by Alternative • Federal Clean Air Act air quality standards would not be exceeded. • No Class I air quality areas would be affected. • No major stationary or mobile sources of air pollution are present on Service owned lands nor would any be created. Adverse Impacts That Would Not Vary by Alternative • Implementation of the CCP would contribute a negligible amount of pollution to the overall air quality of the Richmond-Petersburg MSA. Emissions of ground-level ozone on the refuge have the greatest potential to impact local air quality and would be detected by the air quality station at Shirley Plantation in Charles City County.	
	Beneficial Impacts • Local, long-term negligible benefits in air filtration and carbon sequestration would result from maintaining natural vegetative cover on up to 1,329 acres within the approved refuge boundary of wetland, upland, and open water habitats. Adverse Impacts • Local, long-term, minor adverse impacts would result from emissions generated by equipment used to maintain 200 acres of native grasslands. • Regional, long-term, negligible adverse impacts would result from emissions from vehicles used to transport approximately 640 visitors to the refuge annually.	Beneficial Impacts • Local, long-term minor benefits in air filtration and carbon sequestration would result from converting 177 acres of grassland to transitional mixed mesic forest. • Local, long-term, minor benefits would result from decreased emissions from fuel-burning equipment used to maintain grasslands (e.g., mower, prescribed burning). Adverse Impacts • Regional, long-term, minor adverse impacts would result from fuel-burning equipment used to transport (more than 2,000) visitors to the refuge annually.

Resource or Program	Alternative A Current Management	Alternative B Service-preferred Alternative
Hydrology and Water Quality	Beneficial Impacts That Would Not Vary by Alternative • Federal Clean Water Act water quality standards would not be exceeded. • Federal or State standards for contributing pollutants to water sources would not be exceeded. • Local or regional hydrology and water quality would not be adversely affected over the long term. • Water quality protection benefits would result from increasing the width of the riparian corridor by 11 acres along the western boundary of the refuge along the James River. Adverse Impacts That Would Not Vary by Alternative • Construction of the bunkhouse facility may result in adverse impacts to water quality. Construction and maintenance activities would adhere to best management practices for protecting water quality.	
	Beneficial Impacts • Long-term local benefits for hydrology and water quality would result from protecting streams and other open waters within the approved Service land boundaries. Benefits would be negligible at the James River watershed scale. Adverse Impacts • Local, limited adverse impacts to the James River would potentially result from refuge actions (e.g., trail and facility work) that would increase sediment load and deposition. • Local, negligible adverse impacts would occur to water quality from herbicide use in conjunction with invasive plant management. Impacts would be minimized by using only approved herbicides, developing and following a spill plan, and using the herbicide as instructed by the manufacturer and according to pesticide use plans approved by the regional contaminants coordinator.	Beneficial Impacts • Long-term benefits would result from improved knowledge and management of aquatic resources and their relation to water quality. Adverse Impacts • Local, negligible adverse impacts on water quality would result from construction and operation of a classroom facility, which would modestly increase impervious surface area and wastewater discharge. Any adverse impacts would be addressed through using best management practices and coordinating with State agencies.

Resource or Program	Alternative A Current Management	Alternative B Service-preferred Alternative
Socioeconomic Environment	Beneficial Impacts That Would Not Vary by Alternative • Beneficial impacts would vary between the two alternatives, as described. Adverse Impacts That Would Not Vary by Alternative • No adverse impacts are identified for alternative A or B.	
	Beneficial Impacts • Minimal local economic benefits would occur to Chesterfield, Henrico, and Charles City Counties from refuge staff jobs, income, refuge and visitor expenditures, and the purchase of goods and services for refuge activities. • Local and regional quality-of-life benefits would occur for recreation and wildlife enthusiasts by providing them with wildlife-dependent recreational activities. Adverse Impacts • No adverse impacts are identified for alternative A.	Beneficial Impacts • Local, negligible, increased economic benefits would occur from adding three more refuge staff and the resulting increase in direct and indirect economic activity from refuge staff jobs, income, refuge and visitor expenditures, and the purchase of goods and services for refuge activities. Local economic benefits would also occur from increased visitation (approximately 2,000 more visitors) in terms of retail expenditures for purchasing auto fuel and related expenditures. • Increased quality-of-life benefits would result from improved access to wildlife observation, environmental education, and hunting opportunities. Increased staffing and funding would improve our ability to communicate with the community about the values of Service owned lands and opportunities for recreation under this alternative. • Local, short-term economic benefits would occur from construction of a classroom facility and other upgrade and new construction projects, through local expenditures for labor, materials, and services. Adverse Impacts • No adverse impacts are identified for alternative B.
Soils	Beneficial Impacts That Would Not Vary by Alternative • Beneficial impacts to soils would result from continuing to keep land cover in a natural state and installing the least amount of impervious surface necessary. Native tree species would continue to be planted along shorelines to help control erosion. • Beneficial impacts would result from continuing to prohibit fishing from the bank or shoreline, helping to protect the soils along the shoreline and the steep river escarpment from erosion. • Beneficial impacts would result from maintaining the existing 3.5-mile trail, 550-foot boardwalk and observation platform, and the visitor contact station, to limit visitor impacts to soils. Best management practices would be used to minimize soil erosion and compaction resulting from maintaining these resources. Public access to the refuge would be allowed by permit only, further helping protect the refuge's sensitive soils from visitor impacts. Adverse Impacts That Would Not Vary by Alternative • Minimal, short-term, adverse impacts would potentially result from using integrated pest management techniques (mechanical and chemical controls) to control invasive plant species. All appropriate steps would be taken to minimize the potential for contamination. • Adverse impacts could result from off-trail foot traffic, if concentrated, which could degrade vegetation, compact soil, and cause water channeling and pooling. For the most part visitors would continue to be required to stay on designated trails. Areas of concentrated use, such as around the educational facilities, would be monitored for adverse impacts, and if impacts are noticed, impact areas would be temporarily closed for restoration. • Negligible adverse impacts to soils would occur from hunting, because hunting typically occurs outside of the growing season, when plant growth is dormant and the ground is frozen.	

Resource or Program	Alternative A Current Management	Alternative B Service-preferred Alternative
Soils (cont.)	Beneficial Impacts • Long-term benefits to soils would result from protecting 1,329 acres within the approved Service land boundaries and reduced management activity due to limited staff resources. • Benefits would result from continuing to plant and maintain vegetation in riparian areas to help control erosion, specifically planting native trees in up to 20 acres of transitional mixed mesic forest habitat. Adverse Impacts • Adverse impacts from public use and land management activities may result in localized soil compaction or erosion, and minor soil displacement and loss. Service staff would monitor trails to evaluate ongoing impacts and any need to minimize impacts. • Adverse impacts in the form of soil compaction may result from using the heavy equipment required for mowing and use of prescribed fire as management tools for maintaining the 200 acres of grasslands. To minimize rutting and compaction, equipment would be operated only in dry conditions and outside of seasonally or perennially wet soils. A 15-footwide grass roadway would be used as the predominate route for heavy equipment transport and travel, and potential impacts would be confined primarily to this footprint.	Beneficial Impacts • Long-term benefits to soils from land protection would be similar to alternative A. • Additional erosion and sedimentation control benefits would result from expanded partnerships with (1)USACE, which maintains jurisdiction of the right-of-way through the Turkey Island cutoff channel and monitors erosion along the channel; and (2) owners of the property on the other side of the channel, opposite the refuge, which is also experiencing similar erosion. • Benefits to soils would result from the major reduction in grasslands habitat management and increased management for transitional mixed mesic forest habitat, because nearly all risk of soil compaction or displacement from heavy equipment used to maintain grasslands on the refuge would be eliminated. Adverse Impacts • Localized, negligible adverse impacts to soils in the administrative area would result from upgrades to the existing classroom facility and the approved bunkhouse construction and maintenance. Any risk of soil loss would be minimized by using soil and erosion control best management practices. • Short-term soil compaction and erosion may occur from trail maintenance crews. The impact area would be limited to existing trails, and Service staff would monitor trails and access areas to evaluate any impacts as a result of increased use. • Long-term soil compaction and erosion may result along trails and other access areas from the increased visitation to the refuge, by 500 people per year for programs not affiliated with the Ecology School, and from approximately 200 per year to 2,000 per year for environmental education programming. Service staff would monitor trails and access areas to evaluate any impacts as a result of increased use.

<table>
<tr><th>Resource or Program</th><th>Alternative A
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<tr><td rowspan="2">Freshwater Wetland Habitats and Vegetation</td><td colspan="2">Beneficial Impacts That Would Not Vary by Alternative
• Beneficial impacts would result from the continued maintenance through minimal intervention of the tidal swamp forest, tidal freshwater marsh, and riverine tidal habitats, including the James River and the associated backwaters and tidal creeks, including invasive species inventory and monitoring, and integrated pest management to control invasive species.
• Beneficial impacts would result from continued informal monitoring of sensitive joint-vetch populations.
• Beneficial impacts would result from the continued closure of the refuge to waterfowl hunting and fishing.
• Beneficial impacts to tidal freshwater wetlands would result from continuing to restrict visitors to designated trails.
Adverse Impacts That Would Not Vary by Alternative
• Localized adverse impacts to vegetation could result from refuge administrative activities and public uses on the refuge. Public access would continue to be restricted to the trail network, and the elevated boardwalk, refuge signs, and refuge outreach and education programs require visitors to stay on the trail to minimize disturbance to wildlife and surrounding vegetation.
• Short-term localized adverse impacts to wetland vegetation may result from maintaining the boardwalk. Providing a permanent path for users greatly reduces any long-term adverse effects to wetlands habitat and vegetation from human activity.
• Short-term adverse impacts on vegetation may result from some refuge management and restoration projects, including invasive species control, such as removal of plants, herbicide use, trampling, and other damage to the plants structure. These activities would result in long-term benefits to the diversity and health of the refuge's native plant communities.</td></tr>
<tr><td>Beneficial Impacts
• Benefits would result from the small-scale planting of green ash and bald cypress in the tidal swamp forest habitat.
Adverse Impacts
• Adverse impacts to the ecological integrity of wetland habitats would result due to infrequent and informal monitoring of invasive plant species and rare plant species, and limited ability to use adaptive management techniques.</td><td>Beneficial Impacts
• Benefits would occur from increased monitoring and data collection, allowing for more active maintenance and restoration of ecological integrity of the habitats.
• Benefits would result from expanded partnerships, which would provide additional opportunities to monitor and protect the ecological integrity of the wetland habitats.
Adverse Impacts
• Adverse impacts are the same as those that would not vary between alternatives.</td></tr>
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<table>
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Service-preferred Alternative</th></tr>
<tr><td rowspan="2">Upland Habitats and Vegetation</td><td colspan="2">Beneficial Impacts That Would Not Vary by Alternative
• Beneficial impacts would result from maintaining a portion of the refuge in grassland, managed grassland, river escarpment, transitional mixed mesic forest, or mature mixed mesic forest habitats.
• Beneficial impacts would result from maintaining a managed or mowed grass cover type around buildings, trails, and outside meeting areas.
• Beneficial impacts would result for upland habitats from continuing to use best management practices to minimize any potential adverse impacts from invasive species.
• Beneficial impacts would result for vegetation from continuing to allow the deer hunt, which manages the deer population and reduces negative impacts from deer browsing on the refuge's vegetation.
Adverse Impacts That Would Not Vary by Alternative
• Localized adverse impacts to vegetation could result from refuge administrative activities and public uses on the refuge. Visitors would continue to be required to stay on trails to minimize disturbance to wildlife and surrounding vegetation.
• Minimal, short-term, adverse impacts would potentially result from using integrated pest management techniques (mechanical and chemical controls) to control invasive plant species. All appropriate steps would be taken to minimize the potential for contamination.</td></tr>
<tr><td>Beneficial Impacts
• Benefits would result from informal monitoring of invasive plant species and control of known populations of Johnsongrass in the managed grassland, and privet and tree-of-heaven in the river escarpment, and from planting native tree species on up to 20 acres in the transitional mesic mixed forest.
Adverse Impacts
• Adverse impacts may result from a limited ability to effectively restore disturbed upland areas, stabilize eroded steep banks, control invasive species, and manage large grassland areas, due to staff availability constraints.</td><td>Beneficial Impacts
• Benefits would result from converting 177 acres of grassland/old field habitat to transitional mixed mesic forest habitat, and placing a greater emphasis on restoring and maintaining the ecological integrity of the upland habitats, including inventory, monitoring, and control of invasive plant species; planting of native species; and developing an index of ecological integrity for the upland habitats.
• Benefits would result from expanding the 23 acres of grassland around the administrative and educational complex to 46 acres of managed grassland, providing a higher quality grassland habitat at the refuge.
• Benefits would result from continuing to maintain approximately 46 acres of managed grassland around the administrative and educational complex, which would provide opportunities to integrate small projects into the expanded environmental education programs.
• Further diversifying the mixed mesic forest habitat would provide biodiversity benefits.
• Benefits would result from the greater emphasis placed on restoring and maintaining the ecological integrity of the upland habitats, through increased inventory, monitoring, and control of invasive plant species; planting of native species; and developing an index of ecological integrity for the upland habitats.
• Benefits to the upland habitats would result from expanded partnerships to create greater opportunities for long-term improvements in watershed and river stewardship.
Adverse Impacts
• Adverse impacts would result from reducing grassland habitat by approximately 80 percent over current levels, resulting in reduced vegetative diversity. Managed grassland would remain on 46 acres, and the remaining 177 acres to a more natural mixed mesic forest habitat.</td></tr>
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Resource or Program	Alternative A Current Management	Alternative B Service-preferred Alternative
Species of Special Concern	Beneficial Impacts That Would Not Vary by Alternative • Beneficial impacts would result for bald eagles by continuing to maintain nesting and foraging habitats for them and restrict public access to these areas, closing them as necessary. • Beneficial impacts would result for the federally threatened sensitive joint-vetch by preserving tidal freshwater marsh as habitat for this species and restricting all public access, including hunters, from these areas. • Beneficial impacts would result for the federally threatened Atlantic sturgeon from habitat improvements and data collection, performed by Federal, State, and other partners, to help maintain and restore of this species. • Beneficial impacts would result for these and other species of special concern from information sharing and decisionmaking recommendations, made in coordination with State partners. Adverse Impacts That Would Not Vary by Alternative • Minimal, short-term, adverse impacts would potentially result from using integrated pest management techniques (mechanical and chemical controls) to control invasive plant species. All appropriate steps would be taken to minimize the potential for contamination. • Adverse impacts may result from unauthorized access to restricted areas. Increased law enforcement would be used to minimize such activity.	
	Beneficial Impacts • Beneficial impacts are the same as those that would not vary between alternatives. Adverse Impacts • Adverse impacts are the same as those that would not vary between alternatives.	Beneficial Impacts • Benefits would result for species of special concern from increased monitoring resources and ability to respond with appropriate management actions in a timely manner. Adverse Impacts • Adverse impacts would potentially result from increased visitation and added off-trail usage impacts and disturbance as a result of use. Impacts would be monitored to prevent or correct any unauthorized off-trail use or added disturbance that might adversely impact nesting bald eagles or sensitive joint-vetch populations.

Resource or Program	Alternative A Current Management	Alternative B Service-preferred Alternative
Birds	Beneficial Impacts That Would Not Vary by Alternative • Beneficial impacts would result for priority refuge resources of concern by preserving 738 acres of tidal swamp forest, managing 46 acres of mixed mesic forest, and maintaining 20 acres of transitional mixed mesic forest as breeding and migratory stopover habitats. • Beneficial impacts would result for waterfowl and waterbirds of conservation concern by preserving 189 acres of tidal freshwater marsh as breeding and migratory stopover habitats. • Beneficial impacts would result for State endangered species from continued coordination and maintained partnerships with the State on information sharing and decisionmaking recommendations to protect these species. • Beneficial impacts to waterfowl species would result from the continued closure of waterfowl hunting around the refuge. • Beneficial impacts would result for bald eagles by continuing to restrict visitor access to areas surrounding known bald eagle nest sites during the breeding season, as well as sensitive areas during the wintering season, and for prothonotary warblers by maintaining the approximately 320 prothonotary warbler nest boxes along the major internal streams and along the southeast edge of the island. Long-term breeding studies conducted by VCU on the refuge would continue to be supported. • Beneficial impacts to nesting, migrating, and overwintering birds would result from continuing to prohibit public access into tidal wetland and riverine habitats. Adverse Impacts That Would Not Vary by Alternative • Indirect, short-term, adverse impacts would potentially result to breeding and migrating birds from trail maintenance, invasive species control activities, mowing, and other management activities. • Minimal, short-term, adverse impacts would potentially result from using integrated pest management techniques (mechanical and chemical controls) to control invasive plant species. All appropriate steps would be taken to minimize the potential for contamination. • Adverse impacts would result from increased visitation and potential increased human presence on trails and conducting research, and added off trail usage impacts and disturbance. Impacts adjacent to trails and shorelines would be monitored to prevent or correct any unauthorized off-trail use or added disturbance that might influence impacts on mammals. Environmental education programs, which would contribute to the majority increase in visitation, would be specifically designed to minimize disturbance to nesting birds and other sensitive areas. The most sensitive nesting areas, including bald eagle nesting areas, would continue to be restricted from public access.	

Resource or Program	Alternative A Current Management	Alternative B Service-preferred Alternative
Birds (cont.)	Beneficial Impacts • Benefits would result for migratory waterfowl from maintaining natural vegetation along the James River and associated backwaters as migratory stopover and overwintering habitat. • Minimal benefits would occur for landbirds of conservation concern from maintaining 200 acres of grassland with scattered shrubs, which would provide a small amount of breeding habitat. Adverse Impacts • Adverse impacts would result from the limited ability to measure the effectiveness of management actions on the majority of migratory bird species. • Full benefits from the 200 acres of grassland would not achieved, because large-scale mowing or prescribed fire, necessary to manage or restore this habitat to a condition that benefits grassland nesting birds, would not be feasible for an island environment.	Beneficial Impacts • Additional benefits would result from the process of converting 177 acres of grassland to a mature mixed mesic forest. Initial mid-term (20 years) benefits would result for priority refuge resources of concern as the grassland changes first into a transitional shrub stage. Long-term benefits (more than 20 years) would result for a different suite of species from the eventual conversion to mature mixed mesic forest, enhanced further by planting a more diverse mix of native forest species. • Long-term benefits would also result from active planting and management of the 11 acres of river escarpment. • Long-term benefits for bird populations would result from expanded surveys and inventories, which would help us better understand bird populations and quantify effects that activities on Service owned lands have on such populations. Adverse Impacts • Adverse impacts to migratory Canada geese would result from reduced habitat for this species from the transition of grassland to mixed mesic forest. • Short-term, temporary adverse impacts would result from human presence on trails and research, and the increased potential for off-trail usage impacts and disturbance. Impacts adjacent to trails and shorelines would be monitored to prevent or correct any unauthorized off-trail use or added disturbance that might adversely impact bird nesting.

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<tr><td rowspan="2">Fisheries</td><td colspan="2">Beneficial Impacts That Would Not Vary by Alternative
• Beneficial impacts would result for fisheries habitat from implementing best management practices intended to minimize any sediment load and deposition increases into the James River from refuge actions.
• Beneficial impacts would result from maintaining and expanding vegetated riparian areas and natural habitats to prevent riverbank erosion and provide organic material, which supports benthic macroinvertebrates, an important food source for fish.
• Beneficial impacts would result from continuing to work with partners to monitor the two water quality stations, to improve understanding of the water quality of the James River near the refuge and increase our ability to identify and respond to changes in pollutant levels within the river.
• Beneficial impacts for the Atlantic sturgeon, a federally threatened species, would result from supporting partner efforts to restore and monitor spawning habitat for this species, potentially improving its reproductive success within the James River.
• Beneficial impacts would result from continuing to work with State partners on outreach, education, and law enforcement related to fisheries and aquatic resources of the refuge.
Adverse Impacts That Would Not Vary by Alternative
• Minimal, short-term, adverse impacts would potentially result from using integrated pest management techniques (mechanical and chemical controls) to control invasive plant species. All appropriate steps would be taken to minimize the potential for contamination.
• Potential adverse impacts to fish species would result from sedimentation from erosion and land disturbing activities, which may degrade habitat quality. Best management practices and activities with partners would be used to address impacts from eroding river escarpment to fish species.</td></tr>
<tr><td>Beneficial Impacts
• Beneficial impacts are the same as those that would not vary between alternatives.
Adverse Impacts
• Adverse impacts are the same as those that would not vary between alternatives.</td><td>Beneficial Impacts
• Benefits would be similar as those that apply to both alternatives, plus additional benefits would result from implementing an inventory and monitoring plan, which would improve understanding of aquatic habitats and the impacts of management actions on them and species dependent upon them.
Adverse Impacts
• Adverse impacts are the same as those that would not vary between alternatives.</td></tr>
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Resource or Program	Alternative A Current Management	Alternative B Service-preferred Alternative
Mammals	Beneficial Impacts That Would Not Vary by Alternative • Beneficial impacts to mammals, particularly mammals of conservation concern should they be found, would result from continued coordination with State partners on information sharing and decisionmaking recommendations regarding mammal protection. Adverse Impacts That Would Not Vary by Alternative • Adverse impacts would potentially result from using integrated pest management techniques (mechanical and chemical controls) to control invasive plant species. All appropriate steps would be taken to minimize the potential for contamination. • Adverse impacts may result from disturbance from hunting. Such disturbance is not expected to be significant because small mammals are generally less active during hunting season, making interactions with hunter rare. • Adverse impacts from other public uses may cause disturbance to mammals. Such disturbance would be minimized by requiring visitors to stay on designated trails and outside of sensitive areas.	
	Beneficial Impacts • Benefits would result for mammals from maintaining the diversity of wildlife habitats at current levels. Adverse Impacts • Adverse impacts are the same as those that would not vary between alternatives.	Beneficial Impacts • Benefits would result for mammals that use forest habitats by allowing 177 acres of grassland to naturally succeed into a transitional mixed mesic forest, increasing habitat connectivity and corridors between the mature mixed mesic forest and tidal swamp forest habitats. • Benefits would result from increased survey and inventory work, which would increase knowledge and understanding of mammal populations and help better quantify the status and trends of mammals on the refuge. Adverse Impacts • Local adverse impacts would result from the reduced grassland habitat, particularly those mammals that use old grassland habitat. • Short-term, temporary impacts would result from increased visitation and potential increased human presence on trails and conducting research, and added off trail usage impacts and disturbance. Impacts adjacent to trails and shorelines would be monitored to prevent or correct any unauthorized off-trail use or added disturbance that might influence impacts on mammals.

Resource or Program	Alternative A Current Management	Alternative B Service-preferred Alternative
Amphibians and Reptiles	Beneficial Impacts That Would Not Vary by Alternative • Beneficial impacts would result for amphibian and reptile populations through the continued protection of hibernation, foraging, and breeding habitat. • Beneficial impacts would result from continuing to concentrate public use and activities away from amphibian and reptile habitat. • Beneficial impacts would result from continuing to control invasive plants, so that native plants will be protected as food sources for amphibians and reptiles. Adverse Impacts That Would Not Vary by Alternative • Minimal, short-term, adverse impacts would potentially result from using integrated pest management techniques (mechanical and chemical controls) to control invasive plant species. All appropriate steps would be taken to minimize the potential for contamination. • Adverse impacts may result from disturbance from hunting. Such disturbance is not expected to be significant, because amphibians and reptiles are generally less active during hunting season, making interactions with hunter rare.	
	Beneficial Impacts • Local benefits would result for amphibians and reptiles that use forest, wetland, stream, and open water habitats. • Beneficial impacts would be greater under alternative A for those amphibian and reptiles that require grasslands, particularly old grass habitats, by maintaining more land (a total of 200 acres) in grassland. Adverse Impacts • Adverse impacts would potentially result from the additional grassland management required.	Beneficial Impacts • Major benefits would result for amphibians and reptiles from the increased monitoring of forest conditions, and reptile and amphibian populations, and the increased ability to respond to changes in these habitats with management actions. • Benefits would result for amphibians and reptiles that require forest habitats by allowing 177 acres of grassland to naturally succeed into a transitional mixed mesic forest, increasing habitat connectivity and corridors between the mature mixed mesic forest and tidal swamp forest habitats. Adverse Impacts • Adverse impacts would result from the reduced grassland habitat, particularly for any amphibians and reptiles that use old grassland habitat. • Short-term, temporary impacts would result from increased visitation and potential increased human presence on trails and conducting research, and added off-trail usage impacts and disturbance. Impacts adjacent to trails and shorelines would be monitored to prevent or correct any unauthorized off-trail use or added disturbance that might influence impacts on native amphibians and reptiles.

Resource or Program	Alternative A Current Management	Alternative B Service-preferred Alternative
Invertebrates	Beneficial Impacts That Would Not Vary by Alternative • Beneficial impacts would result from monitoring and managing invasive species that result in environmental harm to invertebrates. • Beneficial impacts would result from preserving native plants to sustain vegetation diversity and in turn likely improve available habitat for invertebrates. Adverse Impacts That Would Not Vary by Alternative • Adverse impacts would potentially result from using integrated pest management techniques (mechanical and chemical controls) to control invasive plant species. All appropriate steps would be taken to minimize the potential for contamination. • Negligible adverse impacts would result from hunting, because hunting occurs during cold weather when invertebrates are inactive.	
	Beneficial Impacts • Beneficial impacts would be greater under alternative A for those invertebrates that require grasslands, particularly old grass habitats, by maintaining more land (a total of 200 acres) in grassland. Adverse Impacts • Adverse impacts are the same as those that would not vary between alternatives.	Beneficial Impacts • Beneficial impacts would result from increased survey and inventory work, which would increase knowledge and understanding of invertebrate populations. Adverse Impacts • Adverse impacts would result from the reduced grassland habitat, particularly for those invertebrates that use old grassland habitats. A small demonstration invertebrate pollinator habitat area within the 46 acres of managed grassland would provide some additional habitat.

Resource or Program	Alternative A Current Management	Alternative B Service-preferred Alternative
Archaeological, Historical, and Cultural Resources	Beneficial Impacts That Would Not Vary by Alternative • Beneficial impacts would result for known archaeological sites and cultural resources and landscapes, which would continue to be protected from unintended impacts, and knowledge and understanding of these resources would continue to be increased. Adverse Impacts That Would Not Vary by Alternative • Potential adverse impacts to the cultural resources of the refuge would result from land-disturbing activities such as new construction and native vegetation planting. Recommendations from the 2009 Archaeological Overview Study would be implemented to minimize impacts.	
	Beneficial Impacts • Beneficial impacts are the same as those that would not vary between alternatives. Adverse Impacts • Adverse impacts are the same as those that would not vary between alternatives.	Beneficial Impacts • In addition to the benefits under Alternative A, benefits would result from conducting a Phase I field investigation and walkover survey to locate any additional archaeological, historical, and cultural resources within the refuge. • Benefits would result through expanded partnerships with the RHPO and Tribal representatives to develop and sponsor a pro-active, National Historic Preservation Act Section 110 initiative; and with the SHPO, Tribal representatives, USACE, and other stakeholders with cultural resource interests and Federal trust responsibilities to develop strategies that emphasize prevention and mitigation of significant cultural resource loss. • Benefits would result from signage and publications, and interpretive trails, which would to further enhance the visitor experience. Cultural resource protection efforts would be integrated into other refuge programs, such as cultural resource interpretation and education, increasing their exposure to visitors. Adverse Impacts • Adverse impacts would potentially result from increased visitation and potential increased human presence on trails and conducting research, and added off-trail usage impacts and disturbance. Sites of known resources would be monitored on a regular basis to reduce any impacts.

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<tr><td rowspan="2">Public Use and Access</td><td colspan="2">Beneficial Impacts That Would Not Vary by Alternative
• Beneficial impacts would result from continued offerings of wildlife observation, photography, interpretation, and environmental education opportunities. The permit requirement would allow refuge staff to limit visitation daily, thereby improving the potential for visitors to observe undisturbed wildlife. Requiring potential refuge visitors offers refuge staff an opportunity to make contact with visitors, provide additional information about programs, and communicate about protecting the refuge's diversity of natural and cultural resources.
• Beneficial impacts would result from public deer hunting.
• Beneficial impacts would result from continued enforcement of the waterfowl hunting closure area on waters within and adjacent to the refuge, as well as through promotion of waterfowl hunting in areas outside the refuge where permitted.
• Beneficial impacts would result from continued promotion of fishing opportunities on waters and lands outside the refuge where permitted.
Adverse Impacts That Would Not Vary by Alternative
• Adverse impacts would result from continued requirement of a special use permit for refuge access and the potential inconveniences for visitors.</td></tr>
<tr><td>Beneficial Impacts
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Adverse Impacts
• Adverse impacts are the same as those that would not vary between alternatives.</td><td>Beneficial Impacts
• Local and regional, minor to moderate, beneficial impacts on environmental education participants would result from increased enhanced partnerships to provide on- and off-refuge environmental education opportunities.
• Local and regional, minor beneficial impacts would result for the audiences served from expanded and enhanced interpretive programs and media.
• Minor to moderately beneficial impacts would result for the hunting community from continuing the deer hunt program and exploring opportunities to enhance the quality of the public deer hunt.
Adverse Impacts
• Local adverse impacts may result from increased visitors engaged in any of the five priority uses. To ensure that increased visitation would not detract from visitor experience on the refuge, a visitor services plan would be developed to monitor the effects of increased usage of the refuge and monitoring data would influence future refuge management decisions.</td></tr>
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